PUBLICATION OFFICES:
168–177 POTTER BUILDING, NEW YORK.
Telephone Call: Murray 586. Cable Address: "Electrical," New York

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Matter for the **Editorial** Department should be addressed to

The Editor of The Electrical World, New York.

Subscriptions and communications relating to **Advertising** or the **Business Department** should be addressed to

W. J. JOHNSTON, Publisher,
Potter Building, New York.
OR EITHER OF THE BRANCH OFFICES.

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New Advertisements.

In the growth of THE ELECTRICAL WORLD in circulation, size and general improvement, the value of its columns for reaching those engaged in electrical pursuits or interested in electrical matters has not failed to be appreciated by advertisers. Readers will find it to their advantage to keep their eyes on the advertising as well as the reading columns. The following are the new advertisements in this issue:

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Vol. IX. NEW YORK, MAY 14, 1887. No. 20

FEW European electricians are so well known as Mr. W. H. Preece, of the English Government Telegraphs, while none are more highly esteemed. Mr. Preece has reached his present distinguished scientific and official position by merit as well as hard work, and even now maintains his activity in research and investigation. The portrait and sketch of his life given in this issue will be noted with interest by all, especially those who have had the pleasure of Mr. Preece's acquaintance in England or during his visits to this country.

WITHOUT doubt many of our readers will be interested in the condensed history of the storage battery which Prof. Vander Weyde read recently before the Electrical Section of the American Institute and was printed in our columns last week. The record shows well that it may require generations to bring to maturity and fruit the germ discovered by the scientist, in the sense of its practical application to the needs of mankind. There are many such cases on record, but few, we think, which have attracted more attention of late years.

WE are sure that our telephonic readers will enjoy and appreciate Mr. Lockwood's piquant paper in this issue, on certain details of telephonic construction and inspection. Mr. Lockwood writes with the utmost freedom and frankness, and as all know him to have the best interests of the work at heart, and as all are aware that he stands second to none in his thorough and conscientious mastery of detail, they who are striving with him after perfection in telephonic service will feel that his straightforward talks, of which this is the second, are calculated to effect great good and to act as a stimulus all along the line.

MEXICO has of late years been the subject of considerable curiosity and interest on the part of electricians anxious to find new opportunities for work there. Hitherto the information has been somewhat vague and meagre. Little, in fact, has been known of the country itself, less of the needs of the people, electrically speaking, and still less of their purchasing capacity as consumers. On the following page appear the introductory notes of some observations recently made in Mexico with the object of learning, with some degree of accuracy, the extent of the attraction and remuneration offered there to enterprise and capital, on the part of electrical applications. The present installment will be followed by a few brief sketches of the electrical development of Mexico in telegraphy, telephony and electric lighting respectively; and it may be added that any questions on the matters discussed will be cheerfully answered, and as fully as possible. The general result reached by the tour of observation recorded is that there are far larger chances of profitable return in South, than in Central, America.

THE study of lightning and its actions has been carried on for nearly two hundred years, and its relation to the ordinary older electrical appliances is now well known. In another column, however, there is brought out a theory of the action of lightning in its relation to electric light lines which is certainly worthy of consideration. Mr. James J. Wood, reasoning from the results of personal observation, sees actual danger in protecting an electric light wire on both sides of the machine, as the arcs formed at the arresters are maintained by the current and serve to short circuit the dynamo and thus to destroy it. As this appears to be a subject of importance, we invite further discussion upon it. The statistics of lightning strokes and destruction of dynamos from that cause have not yet been tabulated, and we would therefore suggest that the operators of electric light stations communicate to us their experience, the manner of protecting their lines, and the accidents, if any. In this way we should be able to synopsize results based upon a large number of lines and machines in a way that would be valuable to all. In some parts of the country the danger and the loss from this cause are quite marked, it is said, and efficient protection is specially desirable.

NEVER has the interest in electrical applications been greater than that of to-day manifested in electrical distribution by transformers. At the same time, the fact is developed that the details of construction adopted by different constructors, though based on the same principles, are quite analogous to those which have been found to be beneficial in dynamo construction. The action in both is identical from the electrical standpoint, and the dynamo builder ought, as a rule, to have little difficulty, technically speaking, in constructing an efficient converter. As Mr. Rankin Kennedy points out, in an article appearing in another column, the rules which govern the construction are quite simple, and it is evident that an efficient transformer is far easier to make than a dynamo of equal efficiency. The comparative output per pound of weight in each is also very favorable to the converter, but this is not to be wondered at when we consider the close relationship between inducing and induced wire in the case of the transformer. Mr. Kennedy's experience will no doubt be read with interest by many. It may be remembered by some of our readers that it was he who made the first practical application of the electrical transmission of power in Scotland, and he is now the first to introduce the converter. Early in 1883 we made note of Mr. Kennedy's work in Scotland in the electrical transmission of power.

THE great value of adding storage batteries to isolated electric lighting plants is well brought out in the article by Mr. C. L. Edgar on another page. The installation there described is one which must necessarily attract attention as it is one of the first in this country in which a fair and honest test of their applicability for this purpose has been undertaken. The success thus far attained, as reported so quietly and conservatively by Mr. Edgar, leaves little to doubt as to the part which the storage battery will play in the future. The addition of the battery outside of its first cost entails, practically, no additional expense. The prejudice seems still to linger in the minds of some that a storage plant must be automatic in all its details to be successful. That it can be made so, and is even operated under these conditions in some instances, is unquestioned; but we doubt the great utility of running a storage battery plant in that way. The nature of the apparatus requires that it should be looked after and kept in good working order like any other part of a plant, including alike the dynamo, steam engine and boiler. This does not necessitate that any additional person be put in charge, but simply entails a little more care on the part of the usual attendant. As pointed out in the article, the details of the installation include elements which are not ordinarily included in such cases, but that have been added in order to obtain a test of the efficiency of the battery.

IT will be seen, from an announcement in another part of this issue, that the American Institute of Electrical Engineers will hold its annual meeting next week in this city. The Institute has manifested its right to existence by steady and useful work, and is now about to enter on its fourth year as a national and comprehensive electrical body, stronger than it has ever been before. It has already published three valuable volumes of proceedings and its fourth will be larger and more varied in contents than any of its predecessors. The Institute deserves the support of all who are interested in the promotion of electrical science, and with funds at its command could do much to render the profession even more respected and influential than it is. It has been a reproach, not without some truth, that many leading electricians have stood aloof from the scientific societies, thus offering a contrast to their European brethren, all of whom of any standing are found in membership, and many of whom, highly distinguished by attainments and in position, are glad to bring their work to notice in papers and reports. However, we think the times are changing here, and are glad to note that two such able physicists and electricians as Professor Anthony and Professor Elihu Thomson are to take part in the proceedings next week. The Institute now has a president of international reputation, an active board of management and a devoted secretary, and should witness a year of marked prosperity. It is, perhaps, somewhat of a coincidence that this week the New York Electrical Society should be celebrating its one hundredth meeting. We believe no other electrical society of scientific character has before reached the age of six years and been able to begin a second century of meetings. The society has always been local in its work, but in a quiet, even humble way, has done much good, and in its present relationships ought to find its opportunities enlarged. While each of the organizations has had its distinct field of labor, there is no good reason why they should not be mutually helpful and beneficial. In fact, the local societies everywhere should join the Institute in some way and thus recruit the ranks of the national body while obtaining additional advantages for themselves.

MR. A. RECKENZAUN, whose work in connection with electric motors and electric locomotion is widely and favorably known, has lately been making a trip throughout Europe to examine into the working of the electric railways there. He now makes a report on his investigations in the shape of a paper read before the Society of Arts in London a week or two ago. The paper enters into a great variety of details. Mr. Reckenzaun finds in active operation the Lichterfelde road, near Berlin, started in 1881; the Brighton, 1883; the Moedling, near Vienna, 1884; the Frankfort-Offenbach, 1884; the Zankerode, mine, 1882; the Hohenzollern mine, 1883; the Portrush, 1883; the Bessbrook, 1885; the Blackpool, 1884. All of these have been and are in full swing, and have between them several million passengers to their credit, while to them might be added the Julien cars in Brussels and Hamburg, as well as the Elieson cars now equipped for the North Metropolitan tramways in London. Mr. Reckenzaun finds that with storage batteries the consumption of fuel in Europe does not exceed 8 lbs. per car mile on ordinary lines, with accumulators not exceeding 25 cwt.; and his figures as to the roads driven by direct current, and enumerated above, show very clearly that the total working expenses do not pass above 7 cents per car mile, there being no reason, he says, why they should exceed 6 cents. Sufficient data has not been accumulated yet on the subject in America to support these statements very positively, but the experience had up to date shows them to be very near the mark. Thus at Baltimore the expenses come out at about 6 cents per car mile, and the results at Appleton, where water power is used, show that figure to be cut under with water power. At Montgomery, Ala., Mr. Gaboury has found with electricity that the actual running expenses have been at least 50 per cent. less than by using horse power, and that in spite of the decrease in cost, the receipts have increased 33 per cent. Moreover, it is to be remembered in comparisons of this kind, that the average American car carries more passengers than the European, and is never full so long as another unfortunate passenger can be jammed in. Coming back to the admirable paper by Mr. Reckenzaun, we may point to it, with its moderation of tone and precision of data, as another striking evidence of the fact that the electric railway is an eminent success, and is in course of rapid development.

The Electrical Industries of Mexico.

BY W. J. JOHNSTON.

1. *Electrical Matters in General.*

Quite a number of electricians and electrical companies in the United States seem to be looking toward Mexico, and wondering whether our sister republic offers much of a field for the introduction of electrical apparatus and appliances, now that the railroads have opened up that country to the enterprising American.

I have just been traveling somewhat extensively through the Republic of Mexico. I visited, among other places, Chihuahua, Zacatecas, Aguas Calientes, Leon, Queretaro, Puebla, Orizaba and the City of Mexico, and looked in a general way into the condition and prospects of the electrical industries in the land of the Montezumas. I may therefore be able to give those interested some idea of what kind of an opening there is for American electricians and electrical developments in that particular part of the moral vineyard.

It is very difficult to say off hand whether the outlook electrically is promising or the reverse. Mexico is so entirely different in all essential particulars from what we are used to in the United States that the two countries cannot be judged by anything like the same standard. It has a population of about 10,000,000, but there are perhaps 8,000,000 of these who practically do not produce or consume anything. Time and labor count for little or nothing in Mexico. Nobody is in any particular hurry, and nothing seems to be done to-day that can by any possibility be left until to-morrow or the next day. Under these circumstances, it can be readily seen that the demand for telephones, the district messenger system or even the telegraph cannot be very great in Mexico.

Outside of these things, there are many other serious and perplexing obstacles in the way of an American doing much business in Mexico. The members of the government have the reputation of requiring to be liberally feed before they will do anything in the way of granting a foreigner a concession, and they are said to have a reprehensible habit of looking for additional fees from time to time afterward, and even on occasions of repudiating their own contracts.

Yet, notwithstanding all this and the fact that Mexico is the strangest, the quaintest and the most behind the-age country I have ever visited—and I have traveled over this terrestrial ball a sufficient number of miles, if they were all added together, to encircle the earth more than once—I still think there is a field in Mexico for applied electricity that it would pay to develop. As showing the condition of affairs electrically, I might mention the case of the Hotel Iturbide, at which I stopped. This is the leading hotel in the city of Mexico, the largest, most important, and most cosmopolitan and progressive city in Mexico, and the capital of the Republic (its population is about 300,000). The hotel was formerly the palace of the Emperor Iturbide, and covers nearly a block of ground. In the good old days it probably gave shelter to several distinguished crowned heads, but it doesn't seem to keep up at all closely with the march of modern improvement. When I had occasion to write in my room of an evening I had to do it—very reluctantly, I can assure you—by the aid of a tallow candle!

There is gas—of a particularly poor quality—in the parlor or reception room, but none in any of the rooms occupied by guests, and not an electric light in any part of the building.

It is but fair to add, however, that there is talk at the present time of putting an electric light plant in the Hotel Iturbide, and that estimates to that end have been furnished by one of the local electric light companies.

Even the building in which the Chamber of Deputies, or Mexican Congress, meets is without electric lights. I visited it on the night of the first session of the present Congress, to hear President Diaz make the opening address, and I found it lighted by three different methods—candles, oil lamps and gas—but there was not an electric light lamp to be seen. Gas, by the way, costs $7.50 a thousand in the City of Mexico. Coal is worth $22 a ton, and the gas is made from wood, which costs $14 a cord. As I said before, the quality of the gas is very poor, but I will have more to say on this subject later on in discussing the subject of electric lighting.

I cite the above to show how far Mexico is behind in the matter of electric lighting. It is just as much behind in the other applications of electricity. It is really very hard for the American visitor to realize that Mexico adjoins the United States and is a part of the same continent. I think, however, that it is even more difficult for him to bring himself to appreciate that the scenes around him are taking place in the nineteenth century. It has been remarked that it seems all the time in Mexico as if it was the year 1640, and four o'clock in the afternoon! but I would be inclined to place it at a much earlier period. As a matter of fact, some parts of Mexico strike me as being as like what the Holy Land was in the time of our Saviour, according to what we read in the Bible, as anything can be. The houses are built just as we see them in pictures of New Testament scenes, and the cities are laid out and resemble in general appearance Jerusalem and other eastern cities. The people carry water and do other things about as used to be done in the days of the Apostles, and if I didn't know better I could easily bring myself to believe that instead of being in Mexico I was in far away Palestine.

I had a good opportunity of studying Mexico, for I traveled, with a number of others, in a special train—under the management of Messrs. Raymond & Whitcomb—running on its own time and stopping where we wished to stop, and met many prominent Mexicans that I should not otherwise have had the pleasure of conversing with. In this way I saw much of the people and their customs that is denied the general tourist or traveler—saw Mexico, so to speak, from the inside as well as from the outside.

The first Mexican city we spent any considerable time in was Chihuahua (pronounced Chee-wa-wa), capital of the State of the same name, which is the largest in the Republic. The city has a population of about 18,000 and is something like 200 years old. Like most other Mexican cities, it does not take kindly to innovations, and its opposition to progress prevented the railroad getting nearer than within a mile and a half of its time-honored precincts. The stations are generally from one to two miles from the cities and large towns all through Mexico.

There were many things about the appearance of the place that struck us as peculiar. For instance, every window facing on the street in all the houses has wooden or iron bars. The interpreter explained that Mexicans are very expert sneak thieves, and that these bars are necessary to prevent things from being stolen when the windows are thrown open, as they generally are all day. We found, too, that the porters of the train were exceedingly solicitious about closing the windows and watching the doors of the cars, to prevent the loss of overcoats and other things lying around loose. At Chihuahua, and at every other place where the special train on which we were traveling remained over night, the train was guarded all night by soldiers! On some of the Mexican roads a band of soldiers is carried on the forward car of every passenger train, to protect the passengers, express matter, etc. On the others about two dozen of the local soldiery at each station meet every incoming and outgoing train and remain while the train stands.

The laws against stealing are exceedingly severe in Mexico. In fact, owing to the depredations committed upon the property of the railroad company, a law was passed a year or two ago which made it a capital offence to steal anything from a railroad company or to interfere in any way with the running of trains or the operation of telegraph lines. Hundreds of men have been summarily shot for petty thefts since then, and yet the stealing goes on. At one place where we stopped, Silao, the train dispatcher told me that two poles had been chopped down and carried away that day, for firewood, the wires being cut and a coil of them being also taken. It is difficult to catch the miscreants. At Aguas Calientes (this is the Mexican method of expressing Hot Springs, or more literally Hot Waters) we had the company at dinner of General M. Orellana Nogueras, the general in command of the Federal troops in the States of Durango, Coahuila and Zacatecas. I was astounded at the absolute power this man has. There is not a man, woman or child in these three States whose life is not in the hands of General Nogueras. He can, without any written or formal decree, have instantly shot anybody in his territory whom he pleases, and this without a trial or anything else. The military authority predominates over the civil, and no proceedings can be taken to overrule his sentences except by appeal to the President of the Republic in the City of Mexico. As the General remarked dryly in conversation with us—through an interpreter—by the time an appeal is made to President Diaz, the man is dead! One instance they related to us shows the power the General has. About three weeks before we were there, the superintendent of the railroad—who was traveling on the train with us—had his horse stolen. He complained to the civil authorities, but they are slow and inclined to shield criminals, especially if the person aggrieved be a foreigner, and they did not seem to take any interest in the matter. Meeting General Nogueras on the train, the superintendent spoke to him about the horse. The General asked him for a description and promised to find the animal. A few days afterward the horse was returned to the superintendent, with the general's compliments, and with the information that the thief had been shot! On the other hand, the general can and does pardon his favorites when they get into the clutches of the civil authorities, no matter what they may have done. In fact he very graciously assured us that if we got into any trouble and would let him know, he would get us out of it. We had no inclination, however, of experimenting in the matter, but I am inclined to think that if I lived in the general's territory I would follow the example of the railroad men, and do my best to get on the good side of General Nogueras.

American Institute of Electrical Engineers.

The annual meeting of the Institute, for the election of officers and the transaction of other business, will be held at the house of the American Society of Civil Engineers, 127 East Twenty-third street, New York, on Tuesday, May 17, at 8 o'clock P. M. A general meeting will be held at the same place on Wednesday, May 18, at 10 o'clock A. M., for the reading and discussing of the papers presented. The morning session will be followed by a collation, and the meeting will adjourn at the close of the afternoon session. Papers have been prepared for the occasion by Prof. Elihu Thomson, of Lynn, Mass., on Novel Phenomena of Alternating Currents; by E. P. Roberts, of Cheyenne, Wyo., on Practical Experience with Storage Batteries; by Joseph Wetzler, of New York, on Electric Lighting for Railway Trains; by J. A. Powers, of Troy, on the Installation of Arc Lighting Plants; by Prof. W. A. Anthony, of Cornell University, on the Differing Temperature Coefficients of the Different Coils of a fine Rheostat; also on the Change from Negative to Positive of the Temperature Coefficients of some Carbon Filaments; by Dugald C. Jackson, of Cornell University, on the Best Ratio of the Section of the Gramme Armature to the Section of the Field Magnets; and by T. C. Martin, of New York, on a Few Comparative Statistics of Electric Railways.

The meeting promises to be unusually interesting, and all who intend or wish to be present should communicate with the secretary, Mr. Ralph Pope, 16 Dey street, who will be happy to give any information on the subject.

Italian Government Regulations for Electrical Circuits.

BY J. W. LIEB, MILAN, ITALY.

As the underground wire problem is now so prominently before the public, I assume that it may interest the readers of THE ELECTRICAL WORLD to learn what conditions must be complied with in some European countries as to the installation of electric light circuits. The following is a translation which I have made of the government regulations for Italy. These regulations emanate from the Telegraph Administration, one of the government departments:

ARTICLE 1. The circuits for electric lighting or any other electrical industry must be wholly metallic. In no part are they allowed to be in communication with the earth. It is therefore prohibited to attach them to water or gas pipes.

ART. 2. In the vicinity of telegraph or telephone wires, electric light conductors must be covered with materials to secure a sufficient electric insulation and be impervious to water.

ART. 3. Wherever the light circuits may be touched by telegraph or telephone linemen in the discharge of their duties, the electric circuits must have a supplementary insulation, and be located at such distance from telegraph or telephone circuits that both cannot be touched at the same time.

ART. 4. Direct contacts between electric conductors and telegraph or telephone wires must be rendered impossible in normal condition of the lines, as well as in case of any breakdown.

ART. 5. The conductors must have sufficient strength to resist any strain to which they may be subjected. If necessary they must be supported along their whole length by wires or metallic cables which present the necessary resistance.

ART. 6. As far as possible the placing of electric conductors parallel to telegraph or telephone circuits must be avoided. When it is impossible to avoid parallelism, the electric circuits must be kept distant from them at least twelve metres (39.3 feet).

ART. 7. Electric conductors must always cross under telegraph and telephone wires, and at a right angles with the same, so that the minimum distances between the lowest telegraph or telephone wire and the nearest electric conductor be at least two metres (6.5 feet).

The points of support of the conductors on either side of the crossing must be at a minimum distance of 3 metres from the telegraph or telephone wires. In order to prevent these wires in case of rupture from coming in contact with the current conductors, there must be located immediately above each conductor and along the whole length of the crossing a guard-wire of the necessary strength.

ART. 8. The party installing or operating his system must take all measures of safety recognized as useful by scientific knowledge and practical experience.

ART. 9. The maintenance of the same must be done with the greatest care, and the system must be closely inspected once a day and maintained in the best condition.

ART. 10. The installer is held responsible for all damages and accidents that may be caused by his system.

ART 11. The government reserves the right to change these rules and make new ones, or to move and take down the conductors at the first request without giving the installer any right to damages.

ART 12. The telephone companies cannot demand the application of articles 7 and 11, except in case they can prove that the contiguity of the conductors disturbs their service on the telephone circuits already constructed.

In regard to telephone wires subsequently put up, it is incumbent on the telephone company not to erect their wires within the distance specified in Articles 6 and 7, and to keep themselves at the necessary distances so as not to be disturbed.

ART. 13. The installer must obtain from the Telegraph Department the permission to install his conductors in the neighborhood of telegrah and telephone wires, and for the modification of any existing plant.

ART. 14. All expenses incurred in the compliance with the precautions mentioned in the preceding articles or the removal of telegraph, telephone or electric wires rendered necessary, must be borne by the installer. If necessary, the work will be executed by the Telegraph Department at his expense.

ART. 15. In case special dispositions differing from the above are found necessary, the Telegraph Department reserves to itself the right to examine the project and to give or refuse its consent according to circumstances.

"Interpole."

To the Editor of The Electrical World:

SIR: I propose the name "interpole" for the space in the dynamo; inter and pole, between the poles. H.

BROOKLYN, N. Y.

A Recent Installation of Storage Batteries.

BY C. L. EDGAR.

Mr. Edward H. Johnson, president of the Edison Electric Light Company, has recently added to the electric plant at his house, in this city, a set of storage batteries furnished by the Electrical Accumulator Company. Mr. Johnson has his house fitted with a large number of incandescent lamps, an arc lamp of the American (Wood) pattern, a Sprague motor and the numerous other electrical details which have made this domestic plant so noteworthy. Until recently it has always been his custom to run the dynamo from late in the afternoon until midnight, by which time the greater number of the lights had been turned off, while during the remainder of the 24 hours he was at the mercy of the "gas fiend." Now the dynamo is not started until the evening load has reached a point where the battery is no longer able to take care of it. This will average at least an hour later than the old starting time, and then, supplying current to all the lamps, and charging the battery at the same time, it is only run until is has stored up a slight excess in ampère hours of the amount which has been taken out during the preceding day. Even during these last two months of winter this point has usually been reached by ten o'clock, and at least one night and often two during every week the dynamo has not been started at all, but dependence has been placed on the battery for 36 hours at a time without recharging. As we come to the time of shorter nights a charge every 48 hours will undoubtedly be sufficient. To prove the faith, which has since shown itself to be well founded, the gas meter was cut off the very day the battery was first charged. Mr. Johnson is so well pleased with its service that he has ordered another set, which is now being placed in his new country residence at Greenwich, Conn.

The accompanying sketch shows the appliances used, and the methods employed in the manipulation of the entire lighting plant. The battery consists of a set of "A" cells, with a nominal capacity of 350 ampère hours, with a limit of 35 ampères output at any one time. The lamps are of 102 volts potential. The battery is placed on shelves in a handsome hard wood cabinet, where the cells are easily reached and examined. The lighting plant originally consisted of a dynamo with a capacity of 100 ampères, the necessary field regulator, and a volt-indicator connected, as shown in the sketch, to the centre of the lighting circuits. When the battery was added, all the remaining apparatus was put up. Although this is not by any means all necessary in the ordinary running of the plant, it has been added to this one for the purpose of making a test, which the Edison Company has been carrying on for the last two months, to determine the value of a storage battery as an adjunct to the ordinary electric light plant.

An ammeter is placed in the battery circuit graduated from 1 to 50 ampères, and is connected so as to measure the current of both the charge and the discharge. As the dynamo was already provided with an ammeter to show its output, a third was connected in the lamp circuit, which not only gave direct readings of the current taken by the lamps, but also, by simple comparison, acted as a check on the correctness of the others. For the purpose of getting a continuous test of the coulomb economy of the battery, under ordinary working conditions, an Edison electrolytic meter was so connected up in the battery circuit that, by means of the contact points of a polarized relay, alternate bottles were thrown in a circuit during charge and discharge. At the end of any specified time there is an absolutely correct record of the ampère hour charge and the ampère hour discharge during that time. There is also a third bottle which is continually in circuit, even when the battery current is reversed, and the resultant deposit, showing as it does the excess of the charge over the discharge, is a register of the coulomb efficiency of the battery. This, too, like the third ammeter, acts as a check on the correctness of the other bottles, each of which takes the current only in one direction.

The variations in electromotive force are regulated by the combined use of the field regulator, the main line resistance and the compound switch. These changes, as they occur, are shown by the volt indicators; the one connected at the lamp centre being kept constant at 102 volts, the other necessarily rising or falling as the counter electromotive force changes.

The battery consists of 55 cells in series, with a nominal E. M. F. of two volts each. The compound switch contains two sets of clips, each arranged on the arc of a circle, with an independent arm running to each set. The last eight cells of the series are connected to the different clips, while the line running from dynamo to lamps is cut, and the two ends are connected, one to each arm. This arrangement will be understood by a glance at the diagram. The dynamo can thus be connected to either side of any one of these eight cells, while the line going to the lamps can, by an entirely independent movement, be also connected to any one of the eight. If each arm is resting on clips connected directly to each other, the line from the dynamo to lamps is practically unbroken, while the cell connected to those clips is the last of the series which is included between the poles of the dynamo. In this case the battery needs as many volts as the lamps, and the remaining cells are simply standing idle.

On the other hand, if the arms are on clips not connected directly to each other, so that the current, to get from one arm to the other, must pass through one or more cells, then the dynamo is charging a number which is more or less than those from which the lamp circuit is taken. The dynamo is generally connected to the greater number, and that being eights cells, there is a possible range of 16 volts between the charging potential and that needed in the lamps. It is in this way that, by shifting the battery arms as the need may be, the dynamo pressure can be gradually raised to overcome the counter E. M. F. of the battery, while the lamps are still kept at their normal potential. In this case all the current used in the lamps must pass through those cells connected between the clips on which the arms are resting.

It is possible that the entire range of eight cells may be connected in this way, and, to provide against an excess of current through them, an extra cell is multiple-arced with each one. This makes 55 + 8, or 63 altogether. To provide against the possibility of 16 volts not being a sufficient range to the charging potential of the battery, an extra variable line resistance is inserted in the lamp circuit. This is used whenever it would otherwise be necessary to raise the lamps above normal E. M. F. in order to get the requisite charge in the battery.

The second volt indicator is connected across the poles of the dynamo, and not only shows the rise of the E. M. F. necessary to overcome the gradually increasing counter E. M. F., but also by a simple computation shows the drop of potential over the line resistance whenever it is in circuit.

There is also a simple galvanometer connected so as to show when, in starting the dynamo, its potential is the same as that of the battery, and, consequently, when the circuit can be closed without altering the resultant E. M. F. In this way the sudden throwing of a load on or off the battery, or flicker in the lights, is prevented. When the switch is once closed and the dynamo is running in multiple with the battery, then, by gradually altering the field magnetism, the load is shifted at will. When the time arrives to cut out the dynamo, a reverse process is gone through, and when the regulating apparatus is so arranged that the dynamo ammeter shows zero, while the other two show the same amount of current, the circuit can be broken. This is done by shifting the dynamo arm of the compound switch to its position beyond the last clip, as shown in the diagram. There still remains in circuit the lamp voltmeter, which, indicating the drop of potential that gradually takes place in the battery, determines when it is necessary to make use of the battery arm of the switch, and thus throw another cell in series. This can be repeated until, with the entire 55 cells in series, the potential drops below 102 volts. The battery must then be recharged.

The manipulation of all this apparatus may seem quite complex to the uninitiated, but it becomes practically simple when we consider that running a battery and dynamo plant is, in many respects, like running two dynamos in multiple, excepting that one, the battery, has no regulator and is made to charge and discharge; or, if we carry out the simile, the battery does its work or is run as a motor, merely by changing the E. M. F. of the other, the dynamo. Of course these changes of potential are continually altering the E. M. F. on the lamps, and it is in using the apparatus for keeping them at normal candle-power that there arises a variation from the old routine methods.

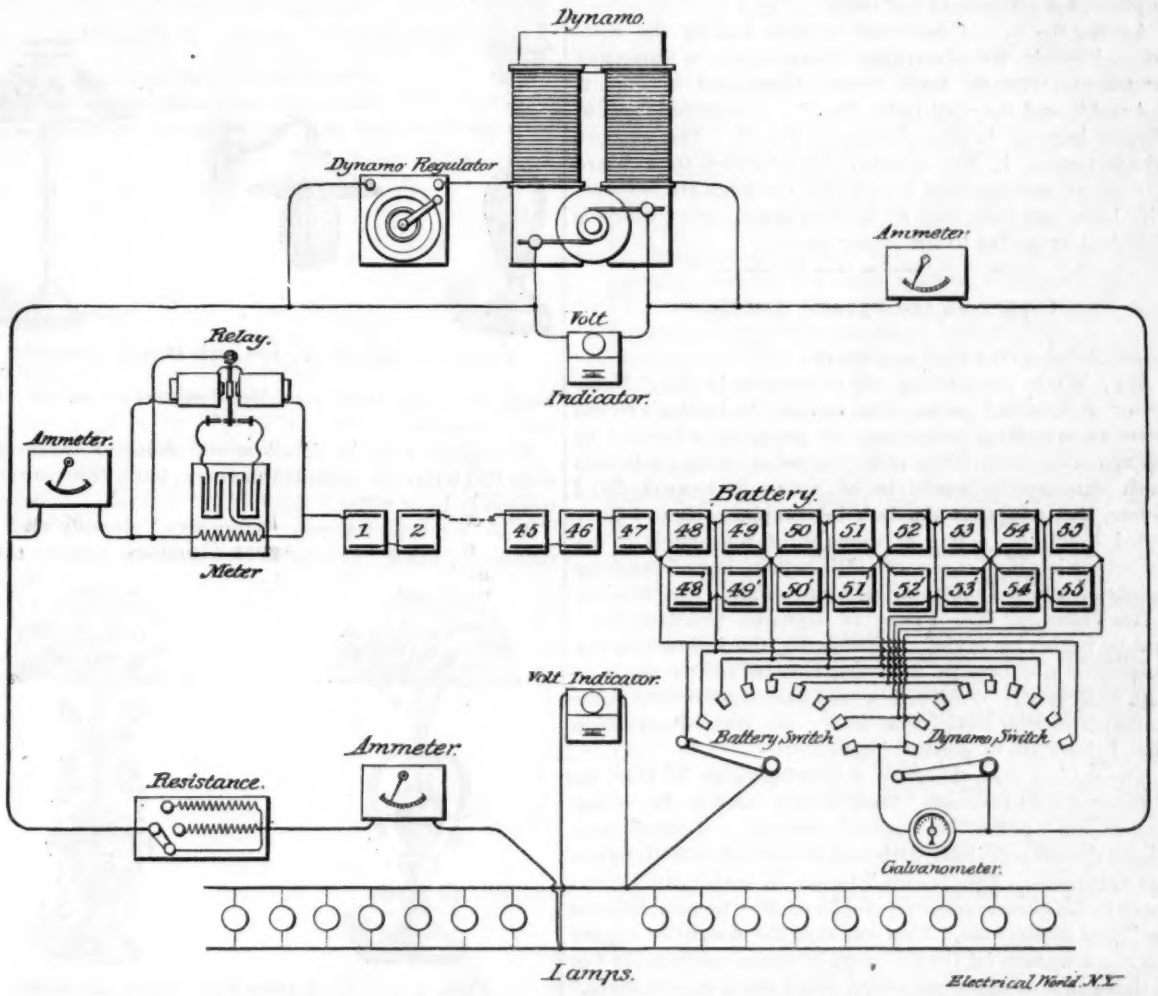


DIAGRAM OF CONNECTIONS FOR ACCUMULATORS IN HOUSE-LIGHTING PLANT.

Speculations on the Nature of Electricity.

BY T. S.

I was a reader of Mr. Carl Hering's speculations on the nature of electricity in your issue of April 23. He would give us the choice of believing it to be "force" or "matter." Now this agent, the electricity which we are discussing, does work, and hence must possess energy. Any primary book on mechanics defines these terms, and "energy" is not "force," neither is it "matter." Hence I would give as the broadest definition: "electricity is *a* form of energy." Permit me to remark here that in my experience there is a popular error in the conception of the terms *force* and *energy*.

When we attempt to discuss, "*What* form of energy is electricity?" the real difficulty commences. Man has not a special organ of sense for its perception, but must study electricity by certain well-known physical effects. This much is certain. Electricity is readily transformed into heat, light, sound, chemical energy and mechanical work. In each case a certain amount of electrical energy disappears, and simultaneously there appears an equivalent amount of energy in these other forms.

Other forms of energy are sound, a wave motion of the air (also transmitted through solids and liquids); heat, molecular vibrations within bodies; light, a vibration of the "luminiferous ether."

None of the motions are visible to the eye, and yet that these forms of energy do exist as these motions in the above-mentioned media can hardly be denied by any one conversant with the many and beautiful experiments adduced in proof. Though we may be able at present only to speculate concerning the motion or the medium in the case of electricity, yet many of its laws are very simple.

There is less positive misconception of the nature of electricity if we look on its laws simply as mathematical aids by which, if properly used, one may calculate the physical effects. I avoid as far as possible attempting to make any mental conception of what volts, coulombs, ohms, etc., are (except as a matter of speculation in an idle moment). A coulomb does not mean quantity to me in any ordinary sense of the word; but I remember that if a certain weight or quantity of metal is deposited on an electrode in an electrolytic cell, a certain quantity of electricity is said to have flowed through the cell. In such a case the coulombs are *measured* by a quantity of deposited metal. The watt-seconds = volt coulombs is a measure of electrical energy, and this product has a well-known mechanical equivalence. If electricity were matter, and a coulomb the unit of quantity, Mr. Hering ought to have told how many coulombs make an ounce. As regards the generation of coulombs, which seems a stumbling-block,

a dynamo certainly generates electrical energy by the consumption of mechanical energy, and a lamp in circuit consumes electrical energy, which is converted into light and heat.

Let me mention a simple experiment, in view of the assumption that electricity is matter. Put two lead plates in sulphuric acid (dilute) and connect five such cells *in series*, and charge with 100 coulombs. Then connect the five cells *in multiple arc*, and they will furnish a discharge of 500 coulombs. Here is a case in which, according to Mr. Hering's reasoning, the quantity did not stay there, but all passed through, and yet these same cells can subsequently give five times the quantity discharged.

As regards this "What is electricity?" question, I have only taken the first step—indicated the nature of the problem—not tried to solve it.

Domestic Electric Lighting.

In a recent issue we described the new battery solution devised by Mr. Wm. P. Kookogey for use in primary batteries designed for electric lighting. In order to facilitate the transportation of the solution Mr. Kookogey has designed the arrangement shown in the illustration, Fig. 1. This consists of an ordinary box, in which bottles holding the solution are placed, but without stoppers. The bottles are sealed by the hinged slats, which are padded and covered with rubber on the inside. Thus, when brought down over the bottles and locked, they not only hold them in place, but effectively seal them.

Among the recent novelties brought out by the Kookogey Electric Manufacturing Company are a variety of ornamental electric table lamps, illustrated in Figs. 2, 3, 4 and 5, and the wall light, Fig. 6. A modified form of plunge battery is also shown in Fig. 7. The carbons which remain in the solution are attached to a board having an oval opening into which the zincs are lowered. The latter are supported by an oval brass carrier which is attached by chains to the lifting gear.

Copper on the Dynamo Armature.

To the Editor of The Electrical World:

SIR: While considering all references to the "Noble Order of Kazoos," bull-dozing, etc., in Mr. Dobbie's recent letter as provoking one to pay no attention whatever to his remarks, and which, if the discussion were continued in the same spirit, would be of no profit to anybody; I notice, however, that Mr. Dobbie complains that I have failed to follow the line of thought of his article in my recent criticism. Let us see. His article, one of the statements of which I took the liberty to correct, was headed, "The Value of Pole Pieces in Dynamo Construction," and he begins by saying, "Following the interesting discussion on the form of field magnets in recent issues of THE ELECTRICAL WORLD, I would like to contribute some some points that have come under my own observation that I think are of general interest."

The subject was, therefore, according to Mr. Dobbie, the "form of field magnets," upon which subject he volunteers some "points of general interest." I cared little about the subject itself, although I did not fail to follow his argument. The "point," however, which Mr. Dobbie gave in his closing sentence (incidentally "he now informs us") did interest me. This was that the weight of copper on the armature (of the Thomson-Houston machine) is 3 or 4 times that of other machines, when the iron "is there." As this presumed statement of fact was misleading, I corrected it in my recent letter and in proof gave some data on the Thomson-Houston incandescent machine constructed with the same "form of field magnets" (subject under discussion according to Mr. Dobbie) placed end on to a spherical armature, and without pole pieces, so-called, just as in the arc machine of the same makers, only with more "iron there."

This machine gave as I stated 611.8 watts per pound of armature copper, while the Elwell Parker machine which Mr. Dobbie now points out, gives but 353, the Weston 300 to 350, with others "which closely approximate this output."

There is no difference in the arrangement of the field magnet of the Thomson-Houston arc or incandescent machines, and yet Mr. Dobbie persists in refusing to admit the bearing of the 611.8 watts upon the subject, for he makes the great discovery, that in giving the data on the Thomson-Houston incandescent machine, I omitted "to mention such a trifling difference as that in the principle of winding the armature!" What this has to do with the "form of field magnets" I fail to see, and would like to know who is off the "line of thought" here? However, I have a little more data. When the Thomson-Houston Company first began to make incandescent dynamos, one of the "*distinctive and original machines*," identical in "form of field magnet" and "principle of winding the armature," *i. e.*, the three coil open-circuit winding, with field coils surrounding it, only with more "iron there," was built, and run successfully for a long time. This machine gave 150 volts and 70 ampères, or 10,500 watts, its armature contained 25½ pounds of copper wire, an output of 411 watts per pound of copper.

I again ask Mr. Dobbie to point out the machine which gives "nearly seven times" that, or 2,800 watts per pound of armature copper, since seven times is Mr. Dobbie's amended proportion, as found in the closing sentence of his recent letter.

Why, it might be asked, did not the company wind this machine for arc lights, since, according to Mr. Dobbie, it would simply be a matter of changing 70 ampères for 10?

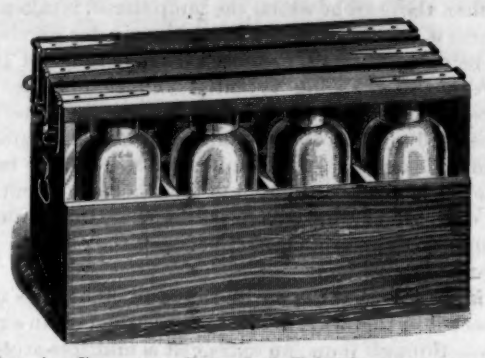


FIG. 1.—SHIPPING CASE FOR BATTERY SOLUTION.

Alas, the "long arc" could not be "bulldozed" into running properly with any such machine.

Mr. Dobbie asks, "What is the difference in magnetizing effect of 10 coils with 10 ampères, etc.?" I said nothing about any difference, but spoke only of the fact that a machine should be proportioned to the work in

FIGS. 2, 3 AND 6.—LAMPS FOR HOUSE LIGHTING.

hand, especially those machines designed to operate "long arcs" in series.

To explain why in detail would demand more space than this letter is intended to cover; but a few considerations may be of value.

A series machine to run "long arcs" steadily and economically, must have as its characteristic a curve which

FIGS. 4 AND 5.—LAMPS FOR HOUSE LIGHTING.

begins to flatten, or, for great stability, even dip, when the normal current is passing through its armature.

There are a number of conditions which may exist in a machine to give this drop or dip in the characteristic at the proper point, among these being the degree of magnetization as regards the saturation limit of armature, of field, or of both; large self-induction and lead of the

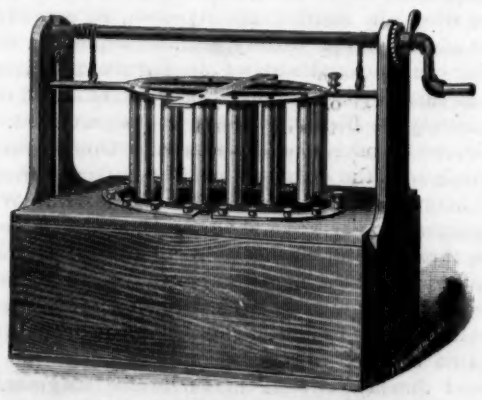


FIG. 6.—PLUNGE BATTERY.

armature winding (which affects the position of the neutral line), the mode of commutation, the use of a copper band under the field coils, etc.

Now a self-exciting series dynamo made with a ratio of copper to effective iron of, say, 1 to 10, and economically magnetized, could not be made to run "long arcs" and give an output at all approximating what the same machine could do on "short arcs," or incandescent lamps; it will not possess the proper characteristic. Such a machine could only operate long arcs by placing in series with the lamps a heavy reactive coil or a dead resistance of considerable amount; but this would involve the use of additional iron and copper outside of the machine, or a great waste of energy in the resistance.

There are several peculiarities of the voltaic arc which combine to make it necessary for the dynamo to possess the characteristic mentioned, the principal being that the resistance of an arc varies inversely as the current flowing, and the long arc has also the additional peculiarity that its resistance varies greatly between its hissing and quiet condition, and that it can change from one condition to the other with the utmost facility, even with the same length of arc, when the average American carbon is used.

If the dynamo used direct with such lamps does not possess the characteristic mentioned and the current begins to increase from any cause, the resistance of the arcs diminishes, a change from quiet to hissing occurs with more decrease of resistance, more current then flows through armature (and field in series machine) producing still more current; the action is therefore cumulative, arc resistance falling and current rising, the limit is usually reached at saturation. The arcs are at this moment drawn to a larger extent than normal, and a diminution of current almost immediately follows, for reasons which I cannot now stop to explain. This weakening of the current weakens the magnetization of the machine, the arc resistances increase, and the current falls off more rapidly even than it rose. A moment later the carbons approach very closely, resistance becomes a minimum and the machine again "takes hold"; the current rises, resistance falls, and the same cycle is again repeated, and will continue until stopped by opening the circuit, or probably by the belt flying off the machine. The action just described is known to those acquainted with it as "building," "oscillating," "pumping," "breathing," etc.

What the future may bring forth in the nature of a series arc light machine with great output per pound of copper, I, of course, would not care to predict. I speak only with present and past experience in mind.

Far from wishing to "bulldoze" Mr. Dobbie into believing that there are radically different types of dynamos for special work, I would simply say that should Mr. Dobbie ever try to make a machine to run "long arcs" with a proportion of copper to effective iron in field and armature of, say 1 to 10 or 15, a proportion perfectly practicable for an incandescent machine of "10 to 400" or more ampères, "that machine" will probably "bulldoze" Mr. Dobbie into believing my statements to be true, and until such time or until Mr. Dobbie can substantiate his statement that the weight of copper on the armature (of the Thomson-Houston machine) is 3 or 4 or even 7 times that of other machines when the "iron is there," I must decline to carry this discussion any farther.

E. W. RICE, JR.

LYNN, Mass.

Patents on Bichromate of Soda in Galvanic Batteries.

To the Editor of The Electrical World:

SIR: Referring to a letter on electric welding in 1862, in THE ELECTRICAL WORLD of March 26, exposing the shameful carelessness of the patent examiners, I wish to call public attention to a similar case which came under my own experience lately; that the slovenly practice at the patent office may be understood and a much needed reform demanded. In October 1885, two patents (Nos. 328,687 and 328,948), were granted to Theo. L. Kauffer covering broadly the use of Bichromate of Soda in Galvanic Batteries, without reference of any kind. On the prima facie evidence of the originality of these claims, as passed by the *examiners* (?) a strong company was formed which bought the patents and spent several thousand dollars perfecting devices to develop and operate the invention. Accidentally, after several months, it was discovered that in 1882 a Frenchman named Jarriant had used soda in batteries and had taken out patents thereon both in France and England (No. 1,956, Great Britain). Fortunately, or unfortunately, Jarriant had the right to apply for and take out patents in the United States, the invention not having been publicly used here for two years. Jarriant's rights (?) were purchased by this same company at considerable additional expense, and application for United States patent made. Jarriant was put into interference with Kauffer, and Kauffer (to save time and expense to the owners) conceded priority of invention to Jarriant, and a patent (No. 2 on bichromate of soda) was in due time granted and duly assigned to the aforesaid company. Again, relying on the scrutinizing search of the patent examiners, who, blundering once, would naturally guard against the chagrin of a second error, more money was expended; licenses under the patent were issued; rights to territory and royalty stamps were sold; when, suddenly news came from London that an English patent, covering the use of bichromate of soda in galvanic batteries, was granted in 1871, so long ago, indeed, that the 14 years of the patent had expired, and consequently no patent could be valid anywhere. But how about the *examinations* in the patent office here? Was there ever such a farce? What are the examiners for? What do they do?

Is it not time that a too-confiding public understood that a patent under the present system of examination, is simply a license issued by the government, to all comers

at $60 a head, under which the inventor *can do his own examining* ? Let other victims speak out, and this crying evil and monstrous defect will have to be remedied.

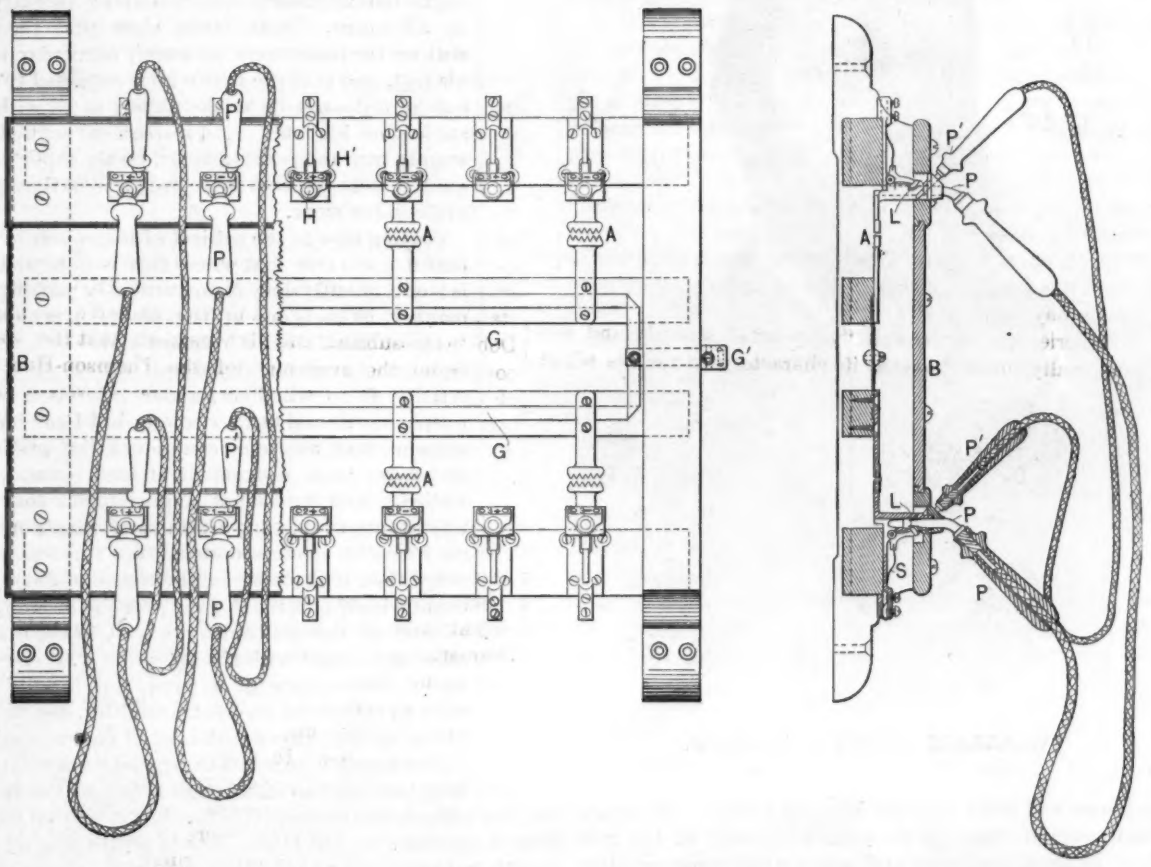
BOSTON, Mass. DE-CEIVED.

The Wood Electric Light Switch-Board.

In a recent issue we illustrated and described in part the switch-board designed by Mr. J. J. Wood for the American Electric Manufacturing Company. As the same embodies a number of interesting details not touched upon in that article, we give on this page a front elevation and section of the board in Figs. 1 and 2. The aim of the designer has been to afford not only facility but also safety in operation, and to provide means of easy access for examination.

The main switch-plugs *P*, it will be noted, have their handles bent downward at an angle of 45 degrees. The object of this is twofold. In the first place, it permits of easy and certain manipulation, and secondly, by this construction the sharp bend in the depending cable is avoided. The brass plug is first soldered to the cable, the handle then slipped over the joined end, and a ferrule, secured by a pin, passing through the entire handle, binds the whole firmly together.

As shown in the sectional view, Fig. 2, the main plugs are notched near their ends so that when inserted into the plug holes *H* they are locked in place by a latch *L* forced into position by a spring *S*. With this arrangement it is impossible for the plug to fall out in consequence of jarring or by any other accident. For, in order to pull out the plug, it is necessary to turn the handle through an angle of 90 degrees, or to a horizontal position. The notch in the plug is then turned clear of the latch and the plug can be pulled out. In addition to the large surface contact of the plugs, the spring *S* gives an additional pressure, so that the plug when locked insures good contact.



FIGS. 1 AND 2.—THE WOOD ELECTRIC LIGHT SWITCH-BOARD.

The transfer pins *P' P'* are provided for the purpose of testing, shifting circuits from one machine to another without interfering with the light, etc. As will be seen they fit into holes *H'* in the same brass casting as the main plug holes. These holes, of which there are two to each plate, are placed at an angle of 45 degrees with the horizontal, so that the transfer pins when inserted stand perfectly clear of the main plugs and do not interfere with the operation of the latter. By means of the transfer pins, tests of current strength, electromotive force and ground tests can be made. For this purpose a ground wire terminal *G'* is provided with plug holes. To the ground wire *G* also the lightning arresters *A A* are connected.

In order to permit of easy examination, the board *B* which covers the interior connections is made so that it can be slid in and out, being merely held fixed by a few screws. In this way any trouble can be quickly located and repaired without dismounting the entire board.

It will be noticed that while two lightning arresters are provided for each circuit, these are not, as usual, attached to the incoming and outgoing wire respectively, but are both connected to the incoming or negative (—) wire. The arresters are made in two sections to economize space, being evidently equal to a single arrester of double the size in each case.

The reasons which have led Mr. Wood to adopt this mode of connection are so interesting that we propose to treat of them in detail. The usual method of connecting the lightning arrester to the circuit is shown in Fig. 3, *A* and *B* being the incoming and outgoing sections ; *A'* and *B'* being connected to ground. Now, according to Mr. Wood, this arrangement may lead to the destruction of the dynamo in case the line is struck by lightning ; not, however, on account of the lightning discharge itself, but due to the short circuiting of the dynamo, which is brought about as follows :

If, for instance, a stroke enters the line at *F*, Fig. 3, and divides, it will reach *A* and *B* and jump across to *A'* and *B'* and pass into the ground. But in jumping the arresters arcs are formed, which, being of comparatively low resistance, are maintained by the dynamo current, which may have an E. M. F. exceeding 2,000 volts. The effect of this is that instead of the current from the machine passing out to line, it takes the path of the arc established from *A* to *A'* to *B'*, thence by the other arc formed to *B*, and back to the dynamo—forming in effect a short circuit, which burns out the machine. Thus while lightning is the primary inducing cause, it is not itself the factor which causes ultimate destruction.

With the arrangement adopted by Mr. Wood the line is only connected to the incoming wire by a single arrester, as shown in Fig. 4. Evidently an arc formed by lightning cannot be maintained by the current from the machine. Mr. Wood is strengthened in his belief as to the correctness of his assumption by the fact that of the large number of switch-boards designed by him, and in use, not a single accident from lightning has occurred.

Priority in "Series" Electric Railways.

To the Editor of The Electrical World :

SIR : While observing the controversy appearing in your valuable paper between The Bentley-Knight Electric Railway Company and the United States Electric Company—the builders of the Short and Nesmith Railway at Denver—I have remained quiet, as these matters, as a rule, right themselves. But I note the statements of Cecil P. Pool in your last issue, in which he claims to be the original inventor of the "series" system. My answers to the claims of Bentley and Knight and Short and Nesmith are matters of record in the Patent Office, but Mr. Pool's statements need answering. He claims to have invented the series system in 1881, but does not state what part of 1881. The "Series" system of electric railways was invented by me in the winter of 1877 and 1878, and ample proofs of which invention are in my possession. In 1882 I began to prepare a pamphlet on some of my electric railway inventions, and this pamphlet was printed in January, 1883, and widely distributed here and in Europe. In it is clearly disclosed the "series" system.

PHILADELPHIA, PA. R. M. HUNTER.

Ex-Governor Evans on the Denver Electric Railway.

To the Editor of The Electrical World :

SIR : My attention is just directed to an article under the above caption in your paper of the 16th ultimo, over the signature of Robert W. Blackwell, general manager of the Bentley-Knight Electric Railway Company.

The article is so unjust to Prof. Sidney H. Short that I deem it my duty to correct its misrepresentations—if allowed space in your columns for the purpose.

The correspondence in December, 1884, to which reference is made, is yet in my possession. It was had at my instance and was turned over to me at the time. I had carried on, at the same time, correspondence with other electricians on the same subject. It was to ascertain whether electricity or cable power was preferable, and especially whether electricity could be relied upon to run street cars. That with the Brush and the Bentley-Knight companies was in reference to the electric street road then in operation in Cleveland, O. I had that road examined by other parties at the time, but their reports were adverse.

The correspondence relates to the terms on which our parties could get the right to use their device and the expense of constructing their railroad, and nothing was communicated but what was public at the time. Nor was there the most remote reference to a single line conductor interrupted at intervals with current breakers or a series road. I therefore protest against the unjust imputation of wrong to Prof. Short on account of that correspondence.

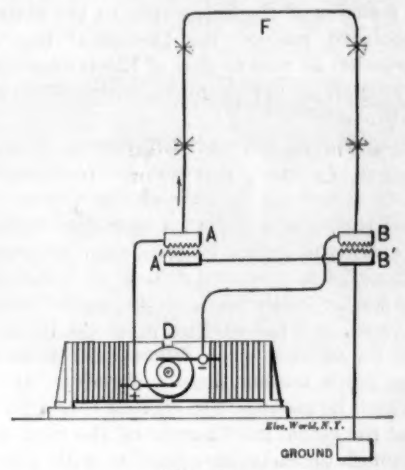


FIG. 3.

Professor Short and the Hon. J. W. Nesmith, who jointly invented the series system, and put "The Denver Electric Railway" in operation, are gentlemen incapable of the act of pilfering charged against them by your correspondent, who admits that they avoided the use of the Bentley-Knight patents.

They were first to put a series railroad with sectional cable, interrupted by circuit breakers, in operation, got the first patent on it nearly a year before March 8, 1887, and I am confident they did not get the idea or device for it from any suggestion from any other parties whatever.

DENVER, Col., May 3, 1887. JOHN EVANS.

The Bentley-Knight Electric Railway Patents.

To the Editor of The Electrical World :

SIR : In the publication of our letter referring to the Short infringements in Denver, an error crept in by which the date of Mr. Bentley's application for the patent granted him on the 8th of last March was given as October 14, 1885, instead of 1884.

We would furthermore say that Messrs. Bentley & Knight's applications for patents have been already involved in three interferences with Mr. Short, and that in no case has the sworn statement of Mr. Short gone back as far as the date when the Bentley-Knight applications were filed.

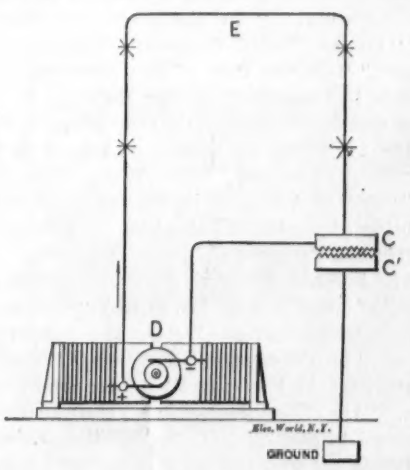


FIG. 4.

ROBT. W. BLACKWELL,
NEW YORK CITY. General Manager.

Output of Dynamos.

To the Editor of The Electrical World :

SIR : In answer to Mr. Rice's communication or challenge, I beg leave to direct his attention to the machines for running the lights of the First Avenue Hotel, London, Eng., of a capacity of 1,000 lights, the whole armature only weighing 84 pounds. What proportion of copper to iron I do not know, but I do not, from the appearance, imagine more than two-thirds can be copper at the very most. In the 2,000 light machine, of same make, the armature weighs only 129 pounds. If Mr. Rice would kindly give weight of copper on fields also, his figures would not look quite so favorable. SUBSCRIBER.

LYNN, Mass.

William Henry Preece.*

We have the pleasure this week of presenting a fine engraved portrait of Mr. W. H. Preece, the well known head of the electrical department of the British Postal Telegraphs. Mr. Preece is a native of North Wales, having been born near Carnarvon in 1834. After receiving his education at King's College, London, he entered the office of Mr. Edwin Clark, C. E., in 1852, and in the following year joined the service of the Electric and International Telegraph Co. Rising rapidly in this company, he became Superintendent of its Southern Division in 1856, and held a similar position for the L. & S. W. Railway from the year 1860, as well as that of Engineer to the Channel Islands Telegraph Co. in 1858. On the transfer of the Telegraphs to the State in 1870 he was appointed one of the Divisional Engineers, from which position he rose to that of Electrician for the whole service in 1877, an appointment which he has held to the present time.

The remarkable gifts of Mr. Preece as a lecturer on science have brought him prominently before the general public, who crowd to the halls of the Society of Arts or the Royal Institution whenever he is discoursing on some of the electrical topics of the hour, or explaining the mysteries of some inventive marvel. His original researches for the furtherance of the special science which he cultivates, and his various practical inventions, have also won the suffrage of his fellow workers and given him a leading place among them. Moreover, the active interest which he manifests in all that relates to his profession, and the genial good humor of the man, are of themselves enough to make him popular with electricians. Mr. Preece is also consulting electrician to the British Colonial Governments. Heis a Fellow of the Royal Society and a Member of the Council of the Institution of Civil Engineers, to which he was elected in 1859. He was president of the Society of Telegraph Engineers for the year 1880, and he is a Member of the Physical Society, Meteorological Society, the Royal Institution, the British Association, and the Society of Arts. Mr. Preece is the inventor of a new method of duplex telegraphy, patented in 1855; a new mode of "terminating" wires (1858); working miniature signals by electricity to assimilate electric signals with outdoor signals on railways (1862); the application of electricity to domestic telegraph purposes (1864); the application of electricity for signaling between different parts of a train in motion (1864); locking signals on railways by means of electricity (1865); improvements in railway signaling to counteract the effects of lightning (1873); a new telephone (1878); improved communication between passengers and guard (1882).

He is a joint author with Mr. Sivewright of a "Text-book of Telegraphy;" has edited several works, and written many papers for the scientific press, among which latter the following may be mentioned:

Before the British Association: "The Telephone," "Recent Progress in Telegraphy," Lightning Protectors," "Recent Progress in Telephony," "Telegraphic Inter-communication," "Domestic Electric Lighting," "On the Watt and Horse-power," "On the Use of Secondary Batteries for Telegraphy," "On the Law of Incandescence and its Relation to Current, "On the Relative Merits of Copper and Iron" (1885), "On the Strength of Telegraph Poles" (1885). Before the Society of Arts: "On the Phonograph," "Cantor Lectures," 1879; "Recent Advances in Telegraphy," "Recent Advances in Electric Lighting," "Electric Lighting at the Paris Exhibition," "Electrical Exhibitions," "On the Progress of Electric Lighting," "Electric Lighting in America." Before the Royal Society: "Studies in Acoustics" (jointly with Mr. Stroh), "On Some Thermal Effects of Electric Currents," "On the Conversion of Radiant Energy into Sonorous Vibrations," "The Effects of Temperature on the Electromotive Force and Resistance of Batteries," "On a New Standard of Illumination and the Measurement of Light," "On the Heating Effects of Currents" (1884), "The Edison Effect in Glow Lamps" (1885), "On Secondary Batteries" (1887). Before the Society of Telegraph Engineers: "On a New Telegraph Wire Gauge," "Telegraphy—Its Rise and Progress in England," "On the Advantages of Scientific Education," "On Lightning and Lightning Conductors," "On the Block System of Working on Railways," "On Shunts, and their Application to Electrometric and Telegraphic Purposes," "On the Measurement of Currents," "On the Phonograph," "On the Connection between Sound and Electricity," "On Winding Electro-Magnets," "On the Durability of Iron Wire," "On Radiophony," "On the Electrical Congresses of Paris" (1884), "A Visit to Canada and the United States," (1885), "Long Distance Telephony" (1886)." Before the Physical Society: "On Some Physical Points Connected with the Telephone," "The Phonograph." For the Royal Institution: "On the Applications of Electricity to the Protection of Life on Railways," "The Telephone," "On Duplex and Quadruplex Telegraphy," "On Wheatstone's Telegraphic Achievements." For the Institution of Civil Engineers: "On the Maintenance and Durability of Submarine Cables in Shallow Waters," "On Railway Telegraphs and the Application of Electricity to the Signaling and Working of Trains," "On the Best Means of Communicating between the Passengers, Guards, and Drivers of Trains in Motion," "On the Progress of Telegraphy" (lecture), "On Electrical Conductors."

It is not too much to say that owing to his exertions the scientific branch of the Telegraph Department of our Pos-Office has become a pattern to the world. The capacity of wires for the transmission of messages has been quadrupled; the quality of the apparatus used has reached well-nigh perfection; scientific methods of the strictest accuracy have been applied to every branch; and a healthful spirit of striving after technical superiority introduced among the staff—a spirit exceptional in government departments, and doubtless due to his early training in commercial enterprises.

* London *Electrician*.

WILLIAM HENRY PREECE.

The Extreme Importance of Attention to Little Things in Telephony.

BY THOMAS D. LOCKWOOD.

Part 2.—Details of Construction and Inspection.

One heresy that I have for years fought is, I am happy to believe, now like the title of "*grandfather*" in the Weller family, almost "*hextinct*." This is the ridiculous idea, that we can profitably employ wire of almost any metal, and of almost any size, however small.

This idea was, in the earlier years of the telephone, exemplified by, and embodied in, the use of No. 14, 16 and 18 steel wire, and the war cry was: "It's all right: the telephone will work over any kind of a line." Of course this was based upon the remarkable powers of the telephone in being capable of giving fair work where no other instrument could or would work at all; and no more satisfactory proof can be given to my mind of the wonderful scope of the telephone than is furnished by some of the fearful and wonderful creations in the way of lines that it has had to work over.

There used to be a saying abroad among some classes of telephone men, that a man coming among them with a telegraphic experience had got to unlearn it all before he could be much of a telephone man. Of course, this was nonsense, and was based upon the habit of generalizing which the best of us are prone to. There were *some* useless telegraph men, ergo, all telegraph men were useless.

But whatever might have been the shortcomings of the *ci-devant* telegraphers who went into the telephonic field, they very reluctantly, as a class, yielded to the small steel wire craze.

Returning to the doings of the rank and file, I would point out that there is nothing calls more for the exercise of good judgment than individual construction.

And "individual construction," in *my* vocabulary, means that class of construction which has to take hold of an already built line, and run a loop, or a branch, from it into a house; or which has to run a short line for a similar purpose.

It is, of course, impossible to lay down arbitrary rules to be adopted in cases of this kind, but I often see instances where judgment might have been exercised and is not. One case came under my notice a little time ago. The job was to get a line wire into the rear of the house from a pole line running along a road about twenty-five yards on one side.

A large pitch-roofed barn stood some hundred and fifty feet in the rear, and close to the roadside between the pole line and house, thus offering an excellent point of vantage. The man in charge of running the line in did pretty well. He mounted an insulator near each end of the barn ridge-pole, ran the wire from the pole line to the nearest ridge-pole insulator, then straight along the ridge-pole to the insulator at the other end, and from the second insulator to the house. He might, however, have done better. He might, if he had given himself time to think, have used but one insulator on the barn, and thus have dispensed with the long stretch along the barn roof; or, if it appeared that a single insulator would not be able to stand the united pull of the line and house wires, he should have separated his insulators by a distance on the barn roof of but 10 or 12 feet. He thus would have secure construction while he would have avoided the long roof stretch with all the liability for sagging, stretching, snow and ice imbedding, and at last, contact, implied thereby.

Or take inside construction. A man who only copies, and in the short time allotted to his instruction finds that the workman he is with fastens the wire to the wall and floor with staples or double pointed tacks, will, to the end of his career, go and do likewise.

A thinking man, who utilizes his God-given intelligence for the benefit of his employer as well as for his own, or who does what is right, upon general principles, will soon fall to thinking whether he cannot alter his methods to suit the case. He will soon find out that in some houses it is best to employ porcelain picture knobs and string the office wire on them; sometimes best to put up cleats and run the wire through them; sometimes well to conceal the wire altogether beneath the floors, and he will always adopt the best and most sightly methods.

We frequently may notice, in our walks abroad, how many telephone boxes are just a little bit out of plumb, and how many more have a vague but impressive air of having recently sat up all night. These faults show that the man that set the instrument up wasn't particular to do his best, and that the man who is supposed to take care of it doesn't lie awake nights at all with the subject on his mind. An instrument set up thoroughly true and perpendicular, on the other hand, quickly tells you that here was a man that takes pride in his work.

Coming now to the subject of inspection, I fear that it is too true that where this is done at all, it is too frequently done in an extremely perfunctory manner. This is one of the points in which the "day of small things" should never be ignored. Opinions based on experience differ quite materially as to whether regular inspection of all telephones should be carried on; but I can hardly suppose that any one can doubt the prudence of having each instrument at least occasionally visited. And it does not appear to me that the importance of having a first-class man for this duty can be over-estimated. Too frequently the inspection, if it come in the course of duty, will confine itself to a rapid gaze over the instrument, a bang at the transmitter, a call to the central office and a chat with the operator; or, if the visit be in consequence of a complaint, it will begin with an onslaught on the transmitter, and end by filling up the battery with a lot of common salt.

Now a man who wants to do good work will carefully look over an instrument before he touches it. He won't attack the transmitter before he knows that much abused appliance to be in fault. He will try the ringing and speech transmitting and receiving powers of the entire apparatus before he makes any changes; and if he finds that the transmitting part of it is not as strong as it ought to be, he still will not be quick to jump to the conclusion that the transmitter itself is at fault, unless long experience with its indubitable signs tell him unmistakably that such is the case. The trouble if the talking is weak *may* be in the transmitter; but it is at least as likely to be a ground or escape on some part of the circuit. This, if near the point where the inspector is at work, would have the effect of weakening the outgoing sounds, while exercising comparatively little effect on the incoming conversation; or, if there is more than one sub-station on the line, it is very likely to happen that the shunt circuit of the generator at one or more of the other stations is imperfect, and leaves the generator coils in circuit. Or, again, and this is more likely than any of the other contingencies, the transmitter battery may be in bad shape. Now, all this takes a long time to write, and a correspondingly long time to read, but it doesn't take a first-class man but a very few moments to think it; while a poor inspector, unless he is one who improves with practice, never thinks of it at all.

Suppose now he gets down to the battery, and finds that it needs some looking to; one man will invariably have his charge of sal-ammoniac with him, and will proceed, if the old liquid (or what is left of it) is clean, to put in the new charge of sal-ammoniac and fill the jar about one-third full of water.

He will scrape the zinc clean, and see that the gas holes on the top of the porous cells are clear, and will then take a look at the porous cell to see that it *is* porous, an occasional one being found pretty hard. If he finds it with a glazed

appearance, he will in some way hammer a few holes in it, of small size, bearing in mind that the only use of a porous cup in a Leclanché cell is to provide a porous envelope round the contents so as to hold them in place. He will then stir up the sal-ammoniac solution, replace the porous cup, brighten the connections and re-attach them.

I have been thus particular on account of a very pernicious little fox which more than once I have caught in this branch of the vineyard. Inspectors of an experimental turn of mind have ascertained that when they put up an exciting solution of common salt instead of sal-ammoniac, they can ring a bell with such a battery in good style. What logic more natural then than this? "If salt is as good as sal-ammoniac for this purpose, why shouldn't I use salt; it is cheap, I shall not have to carry it round, and whenever I go to a grocery store to look at an instrument they will be glad enough to give me all the salt I want?"

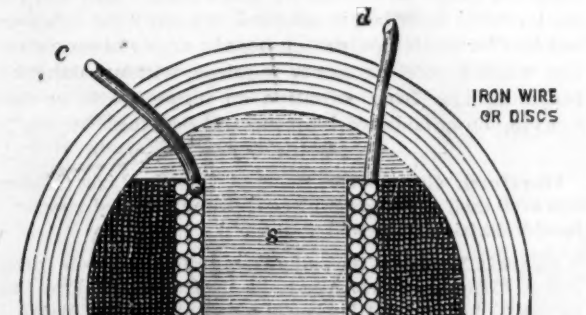


FIG. 2.

Very natural indeed, only the premises are defective. Salt *isn't* as good as sal-ammoniac. The fact is, that the electromotive force of a battery depends as much upon the nature of the exciting liquid as upon the metals which are immersed therein; and the difference of potential between zinc and peroxide of manganese in a solution of sodium chloride, or common salt, is not nearly so high as is that of the same elements in a sal-ammoniac solution. It does not, therefore, produce an equal current, it exhausts itself much quicker, and it produces in a few days a heavy incrustation of salt round the edge of the jar, thus making a dirty cell, and tending by the crystallization to weaken its own solution.

I grieve to say that some managing officials have so fallen in with this pernicious habit as to purchase salt for consumption in their batteries and to enforce its use. I don't know whether such a practice is in vogue anywhere now, but I hope not. So far from this being an economy, it is on the contrary, true economy to pay the best price for sal-ammoniac to get it pure, as the work that can be got out of it is far in excess of the small extra price.

It is not my purpose to go further into the duties of inspectors, and I have only gone thus far to unearth this particular fox.

Electrical Distribution by Alternating Currents and Transformers.

In a series of interesting articles appearing in the London *Electrical Review*, Mr. Rankin Kennedy, whose name has of late become prominent, gives an historical account of the development of transformers and their application to electric distribution. After describing some of the older forms of apparatus, the author enlarges on those of his own construction as follows:

The Dick and Kennedy transformer of the subdivided type is shown in Fig. 1 in its complete form.

In this transformer the magnetic circuit is of the lowest possible resistance giving perfect self-regulation. The core *g*, *g*, is formed of laminated iron having spaces cut out as shown at Fig. 2. Into these spaces are wound the primary and secondary wires, so that each forms a complete little transformer, having its own short magnetic circuit independent of the others. A number of cores containing any number of transformers may be piled one on the other, the bottom of the pile commencing with a laminated plate *h*, ending with another laminated plate on top; a fault occuring in any of the little transformers does not entail the undoing of the whole, in fact, a fault in one of them may be cut out while working by short-circuiting it across or cutting it out of the circuit altogether.

The arrows in Fig. 2 indicate the short path of the magnetic currents. It will be seen that this transformer is a further development of the Pacinotti ring, and it is now necessary to point out this departure in making transformers as commencing a new type. We have first Faraday's transformer, a plain iron ring inclosed by two conductors, then in my ring transformer of 1883 we have the same things, with wires or conductors subdivided into many sections, all having a common core or magnetic circuit. In the Ferranti we have the same things again with the additional outer and inner magnetic sheathing, but still the magnetic circuits are common to all the coils or sections of the primary and secondary.

In the Pacinotti ring, with the sheath of iron wire as made by me, we have an iron core carrying the two conductors in sections: but each section has its own independent magnetic circuit. Fig. 3 shows a complete transformer on this plan.

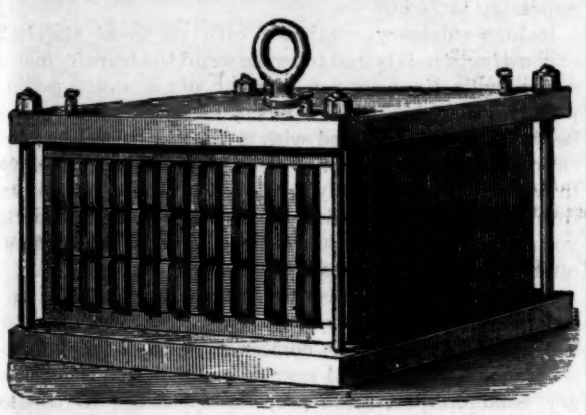
In Fig. 1 this new type of transformer is more perfectly put into practice, and there are other methods than this of carrying it into practice, so that we may conveniently call this type the sub-divided transformer, to distinguish it from those types having a magnetic circuit common to the whole of the two circuits of the conductors.

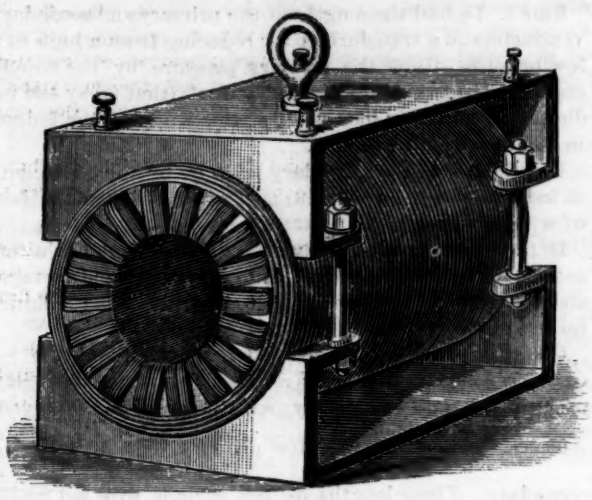
The chief advantage of the subdivision of the magnetic circuit is that it obviates the use of long magnetic circuits, and also the magnetic lines of force in the circuits are of very low density, being that due to the conductors inclosed by it only.

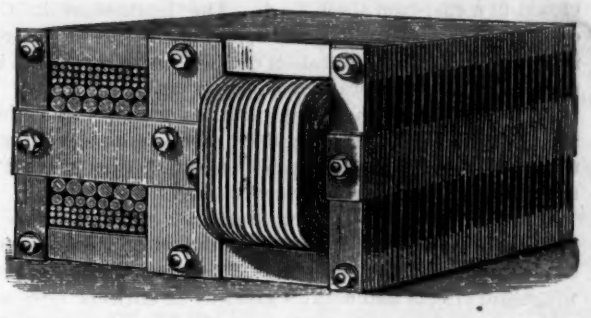
The ideal sub-divided transformer contains a great number of small magnetic circuits, each inclosing one turn of secondary wire and 10, 20 or 30 turns of primary wire as the desired ratio of reduction of potential may require.

Transformers of potential are here classed, according to their magnetic circuits, into three types:

Faraday types. Closed magnetic circuit common to all the coils or sections.	Faraday, 1835. Kennedy, 1883. Ferranti, 1885. Zipernowski and Deri, 1885. Stanley, 1886.







FIGS. 1, 3 AND 5.—DISTRIBUTION BY ALTERNATING CURRENTS AND TRANSFORMERS.

Ruhmkorff types. Magnetic circuit closed through air.	Ruhmkorff, 1842. Gaulard and Gibbs, 1884. Jablochkoff, 1876. Fuller, 1878. And many others.

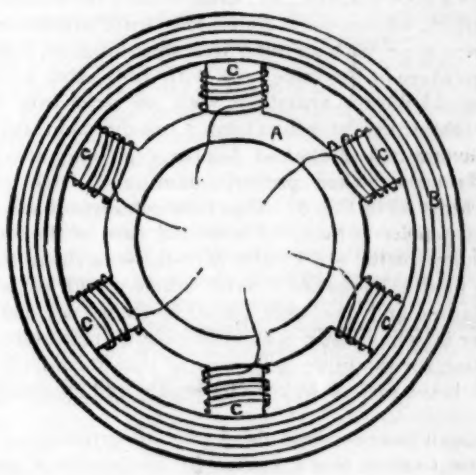


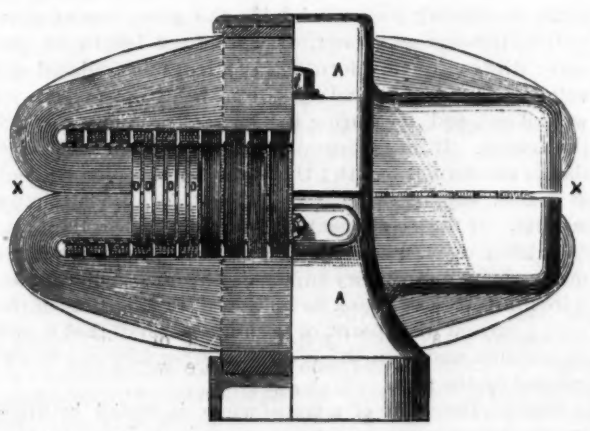
FIG. 8.

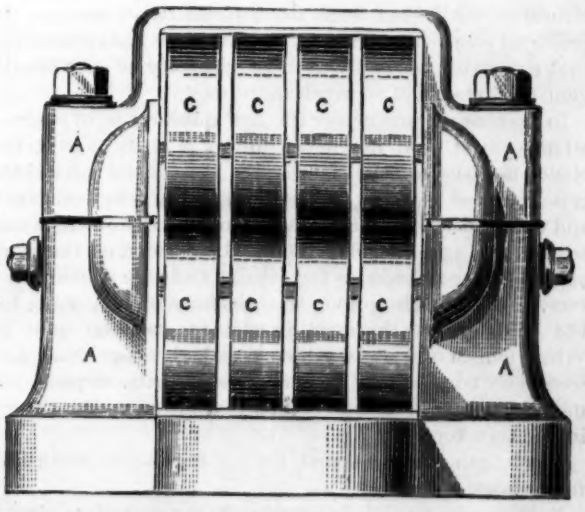
Kennedy type, 1886. Magnetic circuit sub-divided so that each section has a complete magnetic circuit of its own.	The Pacinotti ring with sheath. The square pile of coils on grooved core (Fig. 1).

A very simple and most convenient form of transformer employed by me in some experiments in 1885 consists of a laminated Siemens shuttle-wound armature *S*, shown in Fig. 4. On this was wound 40 turns of No. 12 wire as a secondary *c d*, and over this 800 turns of No. 24 silk covered wire as a primary *a b*, the length of the armature being about 6 inches. This form gives very good results for self-regulation and economy, and I use it generally for distribution purposes for small installations, say up to 1 or 1½ horse-power.

The outer sheathing may be of iron wire or of iron discs, and should be made so that the armature may be withdrawn for repairs.

Fig. 5 shows the construction of the large transformers employed by me to raise the pressure of the electric energy at the generating station; it is built up entirely of hoop iron and bound together by bolts as shown. The primary





FIGS. 4, 6 AND 7.—DISTRIBUTION BY ALTERNATING CURRENTS AND TRANSFORMERS.

coils and the secondary coils are wound on a mold and then slipped on; the thick wire, which is in this case the primary, being first put on, and the secondary or fine wire slipped over it; finally, the strips of iron are placed on the ends and this closes the magnetic circuit. The lamination and ventilation in this form are very perfect.

The Ferranti transformers, Fig. 6, end view, and Fig. 7, side elevation partly in section, are also built entirely of hoop iron. The hoops are laid out in four bundles *C*, *C*, *C*, *C*, Fig. 6, straight and close together; the thick secondary wire *D*, *D*, Fig. 7, is wound on over the middle portion of the bundles of hoop iron, and over this thick wire the fine primary wire is slipped in sections which have been previously wound on a mold. The hoop iron bundles are then divided at *X*, *X*, Fig. 7, into halves, one half bending up over the top and the other bending down under the bottom, thus closing the magnetic circuit; finally, the whole is inclosed in a cast-iron shell *A*, *A*. The lamination in this construction is hardly perfect, as the flat side of the iron is presented to the penetration of the lines of force, but altogether it is a very practicable construction.

There are many other forms of transformers, but as they are all similar in principle and are merely simple modifications of the leading types herein described, they are not of sufficient interest to occupy space here.

I shall now take up the consideration of the actions in the transformer. From a magnetic point of view they are exceedingly interesting; in fact, the consideration of the magnetic effects and actions gives us an entirely new and wider view of magnetism than can be obtained from the consideration of any other electro-magnetic instrument or machine. We shall also take note of the rapidly increasing practical applications of the transformer to purposes other than the distribution of electric lighting.

The number of modifications of the closed magnetic circuit is very great, in fact, any form of dynamo armature makes a good transformer; thus, besides the forms already described, we can use a laminated drum armature of the Siemens type with an outer iron sheathing, or, better still, an armature of the same type with projecting teeth, such as the old Weston armature, with an outer iron wire, or plate, sheathing, and thus form a sub-divided transformer. Pole armatures of the old Lontin type may also be used with success when properly laminated with an outer sheathing, as in Fig. 8. The two conductors are wound on the poles as shown. *A* is an end view of the laminated iron core with *C C C C*, and *B* is the iron sheathing. All these modifications are equally efficient and perfect self-regulators, and the only question to be decided by the maker is which form is the cheapest to manufacture; the question for the intending buyer of transformers is which form is the easiest to keep in repair and cheapest in first cost.

Enough has been said about the construction of transformers to show that it is one of the simplest pieces of electro-magnetic apparatus imaginable. Simply, it consists of two insulated electric conductors combined with an iron magnetic conductor. The only room for improvement lay in this iron conductor, and the experience gained in dynamo building is all applicable in this direction.

We may now inquire into the practical rules for the construction of transformers. Hitherto no definite numerical rules have been published. Transformers have received most elaborate treatment in the hands of mathematicians, and a vast array of formulæ could be here introduced with a view to elucidate the theory of the construction, but I don't think that would be of any use to practical electrical engineers. In this place I am persuaded that a few simple rules within the capacity of any intelligent workman will be much more useful.

In making a transformer the first question is, of course, what form of iron magnetic circuit is it to have? The choice lies between the Zipernowski type or the subdivided type, as these have by far the lowest magnetic resistance and can be perfectly laminated, being equally efficient and self-regulating. The choice must be decided on the score of practical convenience for repairs and ease of manufacture. After deciding upon the best form of iron organ for the transformer, the most important question next is, What length of wire shall be required for primary and secondary conductors? Upon these lengths depend the most important function of self-regulation and economy in the transformer.

The length must be found for self-regulation according to the laws—

1. When no work is being done in the secondary circuit there should be no current in the primary circuit—that is, the counter pressure in the primary must be equal to the primary pressure, or very nearly equal thereto.

2. As the current increases in the secondary circuit, the current in the primary should increase proportionally in the ratio of the transformer—that is, the counter pressure in the primary should fall as work is increased in the secondary.

Here I may observe that there is an impression abroad that the mere employment of the fine wire as primary and the thick as secondary in an induction coil was a great invention made only recently. I am certain that this has been tried by innumerable experimenters during the past 30 years.

To be of any use the wires must be wound to satisfy the laws, irrespective of their thickness or thinness, and then they must be employed in combination with main conductors at constant pressure, and if more than one is to be operated at one time they must be connected in parallel order, and they must be constructed accurately with a fixed ratio. All these imperative requirements are not stated, described or claimed in any one patent yet issued, and yet none of them can be neglected in a system of distribution by alternating currents and transformers.

As the rules for finding the correct lengths, and the reasons for them are obvious enough to those who could follow, I will simply state them as:

Rule 1. To find the lengths of the primary and secondary conductors in a transformer for reducing from a high to a low pressure, divide the primary pressure by the co-efficient of induction in the primary circuit (that is, by the induction in volts per foot of wire); this will give the length in feet of wire for primary.

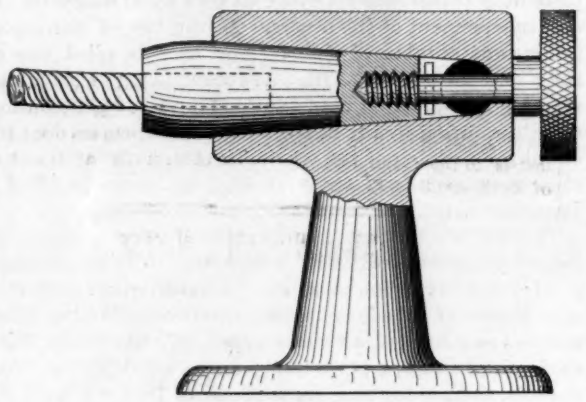
Rule 2. Divide the secondary pressure by the coefficient of induction in volts per foot; this will give length in feet of wire for secondary.

In the best transformers, working with about 200 alternations per second, this coefficient is very high and averages about 2 volts per foot, and that may be taken as the figure for use in the above rules; for example:

Given a primary pressure of 1,200 volts, and the required secondary pressure given as 80 volts, what lengths of primary and secondary wire should be employed?

Answer, $\frac{1,200}{2} = 600$ feet for primary, $\frac{80}{2} = 40$ feet for secondary. These lengths do not include wire not under induction.

If the alternations are not so rapid this coefficient becomes less. It might be argued from this fact that as it is perfectly easy to make the alternations very much more rapid than 200 per second, that, say 500 or 1,000 alternations should be adopted. There is a limit to that; as the alternations increase in number per minute the losses in the transformer increase, and that fact often accounts for different efficiencies being found for the same transformer by different experimenters—the one, perhaps, has employed the alternations for which the transformer was calculated, the other has employed slower alternations, and therefore no agreement could be



A NOVEL BINDING POST.

come to. It is, therefore, necessary to ascertain by experiment the co-efficient of induction for each type of transformer at a given alternation rate. In transformers with long magnetic circuits, common to all the coils of wire, the co-efficient will not be higher than 1.5, and often falls as low as 1 foot per volt.

Practically this co-efficient may be found by taking the given alternating pressure having the given rate of alternations through an approximately correct length of primary wire on the transformer, say a length calculated at 2 volts per foot (the secondary circuit being open or not yet wound on), and measuring the current produced through this length. If no measurable current is observable, then that is the correct length; there should be some current, of course, say, perhaps, two per cent. of the maximum current. If the co-efficient of induction is less than that calculated upon, a considerable current passes in the primary when no secondary current is flowing. The primary wire must, in that case, be increased in length until this initial current disappears, or becomes so small that it is of no account, and then the length of secondary can be calculated by the rule.

Rule 3. The ratio of a transformer is found by dividing the primary pressure by the secondary pressure; thus in my previous example:

$$\frac{1,200}{80} = 15.$$

15 would be said to be the ratio of that transformer, and thus

	Primary.		Secondary.
The pressures are to each other as.....	15	to	1
The lengths of conductors to each other as...	15	"	1
The cross-section of conductors to each other as.....	1	"	15
The currents to each other as	1	"	15

The iron conductor of magnetic force should not at any time be any where near half saturation; it should, therefore, have large cross sections, and data for calculating its size may be obtained from dynamo builders.

The application of these rules to tranformers for *raising* the pressure is obvious, only I may point out that in this case the short, thick wire is the primary, and the co-efficient of induction must be found for it, and the lengths calculated from this coefficient. Of course, the initial current allowable in the primary circuit may be comparatively large (the initial current is the current flowing in primary with no current in the secondary circuit); thus we may have in the transformer primary circuit, with full load on the secondary, 100 ampères at 100 volts pressure, while with no load in the secondary we may have only 5 ampères, or only 5 per cent. of initial current. Of course, by increasing the length of the wire we lower this initial current, but we also lower the coefficient of induction per foot of wire.

Those who wish to study the exact science of the subject should study Mascart and Joubert's work, Hopkinson and Ewing's publication, and the articles by Kapp now appearing in *Industries*.

Its high efficiency, combined with its great simplicity of construction, is bound to recommend the transformer for many applications not yet thought of; it must prove a powerful machine in the hands of electricians when they become better acquainted with it practically. The application of the transformer to electric welding is an example in point. I have recently employed a small transformer for multiplying or dividing the readings of an alternating voltmeter, and by this means I can employ any ordinary alternating current voltmeter, reading between, say, 10 volts and 120 volts, to measure alternating E. M. F. up to any pressure, say 5,000 volts.

A Cardew voltmeter combined with a transformer whose ratio is say 20 to 1 may be connected to the secondary conductor, or, more properly speaking, to the low pressure conductor; the pressure to be measured is connected to the high-pressure conductors, then the readings of the voltmeter have only to be multiplied by the ratio 20 to give the exact pressure in the primary; if the voltmeter indicates 100, then the pressure is 2,000, and so on for any pressure. If we use a transformer having a ratio of 50 to 1, we can just as easily measure 5,000 volts. By this means it is possible to multiply extremely low E. M. F.'s and measure it on ordinary voltmeters. The ratio is constant enough for all practical measurements of alternating E. M. F.'s.

Something might be said about the dynamos, but there is really no new feature to notice about the later alternating dynamos; they are all old types, built with the experience and knowledge obtained from continuous current dynamo evolution.

The rule being to make the magnetic field as powerful as possible, and to shorten the length of wire in the armature as much as possible; as the field gets stronger and the armature wire shorter, so the dynamo improves.

A Novel Binding-Post.

BY JOHN TREGONING.

For some time past there has been in use in the Mather Electric Light Station, of Hartford, Conn., a form of terminal, designed by the writer, which he thinks may be of interest to some of the readers of THE ELECTRICAL WORLD. The annexed sketch, which shows the terminal partly in section, explains itself. The device consists of a taper plug, locked with a screw at one end, and the line wire soldered in at the other. For dynamo purposes, I have designed two connections on one post; three of these double connections will accommodate the field wires, the armature cables and out-going line wires. I may add that the terminal described is adapted not only for dynamos, but also for arc lamps, switch-boards, or any other connection where a good contact is required, without danger of becoming lose from vibration on inside work, or from swaying on outside work for electric lighting.

Hartford, Conn.—The Hartford City Gas Light Company will avail itself of the power given under an amended charter, to furnish electric light as well as gas.

Against Nevins.—The majority report of the Bacon Investigation Committee recommends the indictment of Fire Chief Nevins for bribery and larceny of money extorted, as shown by the recent electric light inquiry; and it also accuses Mr. Cooper, president of the Municipal Company, of deliberately withholding the truth when put on the stand.

Electric Light on Staten Island.—An exhibition of electric lighting by the Edison municipal system was given on May 10, before the trustees of Edgewater, New Brighton and Port Richmond, at Bachmann's brewery, Clifton. The purpose was to show the character of light which it is proposed to give Staten Island for the illumination of its streets, should contracts be awarded to a new company that is about being formed for that purpose.—*Mail and Express.*

Electric Lights in Mines.—Talk of lighting up mines with electric light, Wales has begun. James Sparrow, of the Ffrwd coal and iron works and colliery—taking light down below—with electricity. Although the place is not one of the largest concerns in Wales, Mr. Sparrow is "an old bird," and is one of the most advanced employers, intellectually and scientifically, in the Principality, and is also one who wields a powerful influence over employer and workmen.—*English Labor Herald.*

New York City Franchises.—A stormy meeting of the New York City Aldermen was held on May 10 as to the franchises for lighting in this city. An effort was made to get under the consideration of the board the resolutions granting franchises to the Waterhouse, American, Mount Morris and Ball companies now "tied up" in one way and another. The attempt was defeated in each case brought up by 15 to 4 votes, leaving the matters where they stood, and thus checking the efforts made by the companies in question to obtain franchises and get to work.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, May 9, 1887.

As is well known, Newark, N. J., has within its confines a large number of industries directly connected with or closely allied to the applications of electricity. A great many of these have already in more ways than one been familiarized to your readers. While over the other day I happened to meet Mr. H. Parsons, of the Watts-Campbell Company, of Newark, and was greatly interested in what he told me about their improved Corliss engines with compound cylinders. Mr. Parsons tells me that the company are now completing some 1,500 h. p. for the Clark thread factory, where they now employ about 8,000 h. p. The new compound twin engines are said to give some remarkable results in the economical consumption of coal. Mr. Parsons has made various tests, and finds that on selected coal he will consume 1½ lbs. to the horse-power at 80 lbs. pressure, with only 3 per cent. ash, and with the general run of coal he will guarantee a horse-power to 1¾ lbs. He is now at work on a number of interesting matters of engineering development, and will, I think, soon have further successes to talk about.

Those engaged in electrical experiments and work requiring drilling, or in fact any mechanic in need of a small light drill, will welcome the appearance of the new Stearns bench drill, because it combines the two most distinctive features needed by them, it is claimed, the most perfect working machine of the kind ever yet offered, and again the cheapest. Although so recently introduced to the trade there have been several thousand sold, which have given entire satisfaction, and more particularly in regard to the two characteristic features above mentioned, *i. e.*, perfection and price. The entirely new feature of this drill consists in the spindle being fed down quickly to the work by simply turning the crank and by reversing the motion of the crank, the spindle is as quickly drawn from the work. It is 24 inches high, drills ⅛ to ½ inch hole square with the bed plate. The run of the screw is 3½ inches, the drill stock is 1⅜ inch in diameter. Each drill is furnished with a chuck which attaches to the spindle and will hold a ⅜ round drill or the ordinary square tapered shank or brace drill. The balance wheel weighs six pounds, which is sufficient to carry an ordinary drill smoothly and is not heavy enough to break small drills. The bearings are carefully finished with standard size reamers, and all parts are interchangeable. The crank has an extension for large drilling, and all allowances have been made for strength and durability. Excellent material and workmanship have been used in the construction, the main standard nicely japanned, the hand wheel nickel plated and the balance wheel painted vermilion, the combination not only making a useful and attractive but highly finished machine. Illustrated circular and prices will be sent upon application to the manufacturers, Messrs. E. C. Stearns & Co., Syracuse, N. Y.

Hanson, Van Winkle & Co., another Newark concern, have moved into comfortable and handsome offices, 219 Market street. They carry a full line of electroplating supplies, dynamos, etc. I notice that they have improved on their plating machines in many respects, but this is not as well known as it should be, the concern preferring, it would seem, to hide its light under a bushel.

Electric lighting is on the increase in Newark, as well it might be, with so many local companies, such as the United States, Schuyler, Westinghouse, etc. Of the Westinghouse, by the way, I heard a prominent opponent, whose interests lie wholly in other systems, speak very highly of the brainy pluck and enterprise shown by its promoters and electricians, and a specially kind word was said for Mr. Alex. P. Wright, who is doing good work at Plainfield with the alternating system, and who is certainly one of the most popular men in the profession. After all, if there is, as seems to be, something of value in the alternating system, it will live, no matter who may cry it down, and if it is not a thing of reliability, permanence and economy, it will go without any push from jealous hands. Merit—not less than "time and the hour"—runs through the longest day.

The New York Carbon Works, Henry Muller, proprietor, are finishing the new factory in Newark, adding several ovens and machinery to meet the demand for the special carbons for primary batteries, and especially for acid batteries for electric lighting purposes. The business has been so specialized and developed that it is now adequate to all demands, but is kept active without any intermission. The New York offices are at 39 Dey street.

The high speed horizontal engines of the New York Safety Steam Power Company, 30 Cortlandt street, E. T. Copeland, general agent, are designed to meet the popular demand for concentrated power. They are compact, well-built, powerful machines, as can be inferred from the illustrations which have appeared in your columns, or which may be seen in their catalogues. The substantial form of "bed," with the overhanging cylinder; the locomotive style of cross-head, guides, etc., are details of construction highly approved and indorsed by experience. The working parts are few and simple, and easily understood by ordinary mechanics, and are all easily accessible. Each engine is equal to its rated capacity in h. p., carrying full loads in a smooth and noiseless manner, and the governor controls the load within 2 per cent. The valve chests are detachable and bolted to the side of the engine. No packing is used, as the surfaces are scraped true, thus constituting a metallic joint. The ports are large and full, and clear all around. The Davis piston valve is used; it takes steam at the ends, none passing around. A good practical point is that the automatic governor is in the out side of the draft wheel, and convenient to get at for regulation. Lubrication is automatic. All the parts are interchangeable. Put all these points of excellence together and the result cannot be anything but a first-class engine for electric lighting.

Vacuum pumps for exhausting incandescent lamps before sealing are being made by the Clayton Air Compressor Works, Brooklyn; office, 43 Dey street, this city. These pumps are now in use by the Fort Wayne Jenney Electric Light Company, Mather Company, Heisler Electric Light Company, and others.

The Commercial Cable Company has moved from its cable office to new quarters on the ground floor of the Drexel Building, corner of Wall and Broad streets.

The Staten Island Amusement Company, through its president, Erastus Wiman, on Monday closed a contract with the American Electric Manufacturing Company for a 164-light plant for St. George and Erastina. The Brush apparatus was used in both places last year, but will be removed for other work elsewhere. This order was taken by Mr. Thomas Grimwood, one of the livest agents of the American Company.

There has recently been, it is said, a movement to oust Mr. Goff from the presidency of the American Company. It happens, however, that Mr. Goff has the proxies on 75 per cent. of the entire stock, from which it is plain that the plan won't work. To Mr. Goff belongs the credit of making the company what it is, and at its helm he will stay.

The New York Insulated Wire Company have opened very handsome salesrooms at 452 Broadway, under the management of James W. Godfrey, who has been appointed general manager of the company. Mr. W. B. Dowse is to give his personal attention to the manufacturing department at their factory in Reading, Mass., which is a sufficient guarantee that only first-class goods will be produced. They are about issuing a revised price-list and circular to the trade.

I hear some very good reports of the operation of the electric gas-lighter of the New York Electric Brush and Ozone Company, of this city. I might mention that the application occasionally of a little vaseline to the hard rubber disc makes a great improvement in the spark effect. Agents and dealers should bear this point in mind.

Hazazer & Stanley, 32 and 34 Frankfort street, still continue active in their good work of the electrical evangelization of New York City, where they are familiarizing not a few of the citizens with the advantages and comforts of household electrical apparatus, their specialty being annunciators and bells. The work is to be seen in such houses as those of Vanderbilt, Field, Marquand and Iselin, not to mention apartment houses and office buildings by the score. They have also a large out-of-town demand for their goods.

A fire occurred last week at 237 Mercer street, occupied by Zimdar & Co., manufacturers of electric bells and burglar alarms, causing a loss of $1,000 on the building and contents.

The McMahon-Flynn litigation is still dragging its weary length along, and several additional witnesses, more or less prominent, have been called to the stand. Among these have been the capitalists and financiers who were on the directorate of the Subway Company when it was formed last year. It would appear—as was natural—that most of them were but figure-heads. Thus Mr. E. Balthazar, who took the chair at some of the meetings when the Consolidated Company was getting under way—or underground—doesn't remember whether he was vice-president or not, and says he never paid in a single dollar. Mr. H. J. Davidson had 20 shares of stock, but never saw it and never paid for it. Mr. J. B. Houston never did anything, never paid anything, and at last resigned. Two of the bondsmen stated that they went on the Consolidated Company's bond to oblige Mr. Flynn, who was to indemnify them in case of emergency. Mr. Burdick, Mr. Dorsett's associate, has given a little more evidence as to the $5,000,000 company that was talked about before the American Insulated Conduit Company was formed with $200,000, and Dr. A. R. Ledoux, the expert, has testified as to the examination he made of conduits at the instance of Mr. Roswell P. Flower.

W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, May 10, 1887.

I would like to overcome my usual modesty to the extent of reporting that the New England number last week of THE ELECTRICAL WORLD has brought me personally a large number of congratulations, the electricians and business men of this section feeling that a good presentation had been made of the electrical work going on here. I must confess I was surprised myself to see how much activity and enterprise was revealed, when all the various items and articles were assembled. New England certainly can hold up her head with pride when she places her electrical industries in comparison with those of other parts of the country. I had but one drawback to my pleasure, and that was to see that the compositor had managed to put the wrong lamp in the special announcement of the Sawyer-Man Company. The company is making its lamp with the half twist filament, and I may mention that the two factories turning it out are in full blast, with an immediate extension of facilities demanded.

A report comes from Richmond Me., that a movement is on foot in that town to organize an electric light company. Mr. H. A. Foster is said to be the prime mover in the enterprise referred to.

The Loomis Electric Manufacturing Company, of New York—with offices also in Boston—is showing (for a new enterprise) remarkable progress. In addition to the installation of its system in Canada, referred to in THE ELECTRICAL WORLD, April 23, it is equipping several plants in various sections of country.

At a recent meeting of the selectmen of Hyde Park, Mass., it was decided to contract with an electric light company to illuminate the streets of that town with arc lights, for a term not exceeding five years, at an annual cost of not more than $4,000.

Mr. P. H. Alexander, manager of the New England Agency of the Sawyer-Man Electric Company, reports having just closed a contract with the Kearsarge House, White Mountains, N. H., for 125 (16 c. p.) incandescent lights. This is said to be the first hotel in the White Mountains to inaugurate this much needed change; and by thus catering to the demand of its patrons—for electric lights—it will doubtlessly enhance its popularity and increase the number of its guests. It is predicted that proprietors of other White Mountain hotels will quickly follow the example set by their more enterprising neighbor.

In my notes in the May 7 number of THE ELECTRICAL WORLD I erroneously stated that the contract for lighting the Ludlow Manufacturing Company's works with incandescent electric lights had been awarded to the United Edison Manufacturing Company as the outcome of a test recently made by several competing companies.

My mistake was caused by having misunderstood one of the gentlemen attached to the New England office of the Edison Company, who made a hurried reference to the 50-light incandescent plant sold by his employers to the Ludlow Company several weeks ago. No contract has yet been given out for the 1,500-light incandescent plant by the Ludlow Manufacturing Company, for which three prominent electric light companies are making competitive tests.

At a special meeting of the selectmen of Woburn, Mass., on the evening of May 5, it was agreed to make contract with the Woburn Electric Light Company for furnishing forty arc lights as illuminants for the streets for a period of two years, and the town treasurer was authorized to sign the contract. By the terms of the contract all the lights are to be used from sunset until midnight, and about fifteen of them until sunrise. The amount to be paid the company is $2,500 annually.

At a recent town meeting at Melrose, Mass., the selectmen were authorized to provide electric lights for the streets, but there has been so much opposition raised during the past week that the board has done nothing in regard to making contracts, although the Malden Electric Light Company has made a liberal proposal. It is probable that a special town meeting will be called to consider the matter.

The regulators that are being used by the Standard Electric Time Company, of New Haven, Conn., with the Warner single circuit system, of which you gave a description last week, are made by the Self-Winding Clock Company, of New York City.

The Fitchburg Steam Engine Company, of Fitchburg, Mass., report business very good with them now. They have orders on their books for four 125 h. p. engines, two 100 h. p., three 90 h. p., one 75 h. p., one 60 h. p., five 50 h. p., one 40 h. p. and six or eight smaller ones. Four of the above engines are for Canada parties. They are running their full force of men full time, and report prospects flattering.

Mr. Herbert H. Eustis, electrician of the Eastern Electric Cable Company, Boston, Mass., was formerly of the firm of Jaques & Eustus, manufacturers of the Faraday cable, now made by the American Electrical Works. Mr. Eustus is a graduate of Harvard, and was two years afterward connected with the Clark Wire Company at Bristol, Pa. For some time past he has been with the Eastern Electric Cable Company, having charge of the electrical department and superintendent of the general work about the Hampshire street factory. At the February meeting of the National Electric Light Association, at Philadelphia, Mr Eustis was placed on the Gauge Committee.

I happened into the offices of Messrs. Paine & Francis—the Edison Company's New England agents—a day or two ago, and was shown some Edison lamps, each of which possesses quite an interesting history. One of these was presented by Jordan, Marsh & Co., where it is said to have burned daily during a period of four years, at an average of five hours. Another lamp was a gift from the *Herald* counting room, where, so it is claimed, it burned for seven thousand hours, a most remarkable performance. The two lamps referred to were alternately placed in circuit by Mr. Francis, and burned bright and steady, and I noticed that, notwithstanding the long life of the lamps, very little discoloration had taken place in either.

The Ball Electric Light Manufacturing Company, of New England, continues to keep up its popularity among its patrons. Mr. H. M. French, the general manager, assisted by his two sons and Mr. L. A. Bigelow, has made a large number of successful installations of the Ball system in the New England States; and, so far as can be learned by the writer, all the plants using the "unipolar" machine have given satisfaction.

The Bickford Railway Station Indicator Company, of Boston and Salem, Mass., contemplates at an early day reorganizing and making a change in its corporate name. The company has a system of signaling well worthy the attention of railway people. The various electrical and mechanical appurtenances owned by the company are the inventions of Mr. J. H. Bickford, of Salem.

The Humphrey Machine Company, Keene, is selling a good number of its water-wheels, especially of its circumshot wheel, which gives the best of satisfaction where it is tried. It has lately put two of these wheels into two mills of Gardner, Mass., which show a very high per cent. of power from water passing through the gate.

Seventeen of the twenty-three young men who graduated a year ago from the School of Mechanical Arts at the Massachusetts Institute of Technology gathered at Young's Hotel last week, for their first annual reunion and banquet. The gentlemen who comprised the party were E. G. Osgood, W. C. Smith, T. N. Tripp, F. A. Whitney, R. L. Harris, B. M. Howe, W. P. Richardson, F. C. Goddard, R. A. Leigh, W. G. Wright, J. T. Ball, R. H. Sutherland, H. P. Benson, W. F. Dawson, N. R. Pratt, Mr. Stanford, H. G. Woodward.

W. I. B.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, May 7, 1887.

In my letter of two weeks ago I mentioned the incorporation of the Chicago Arc Light and Power Company. This company mean business right from the start. They contemplate the putting in of several thousand arc lights in this city in the near future. They have already acquired all the existing local plants except about 300 lights. This will enable them to start off with about 700 lights. The capital stock of the company is $1,000,000, all money. Mr. C. N. Fay will probably be the company's president, and Mr. F. W. Cushing has already been selected as the general manager of the company's business. The company, in addition to acquiring much of the local plants, has also obtained control of the Chicago Sectional Underground Conduit Company. This gives them seven and a half miles of street conduit and fifteen miles of pipe, and I understand that the conduit system is to be still further extended. A large station will be built near the business centre on the South side and the intention is to do the lighting for both the South and West sides from this one station. It will probably be necessary to erect an additional and smaller station on the North side.

You will see that this company is very strong in every way; it has possession of the conduits, and will be ably managed. This is the strongest local lighting company in every way that Chicago has ever had, and I expect to see remarkable activity in local lighting as the result.

Mr. C. N. Fay, who, as you well know, is the general manager of the Chicago Telephone Company, and who, as I mentioned above, will probably be the president of the Chicago Arc Light

and Power Company, is also the "Company" in the firm of Johnson, Holland & Company, a new concern just starting in busines, here, at 227 La Salle street.

Johnson, Holland & Co. have the agency here for the Electrical Accumulator Company's storage batteries. Mr Truex, secretary of the parent accumulator company, is now in town, and in a few days Johnson, Holland & Co. will have their offices lighted by an accumulator installation capable of feeding 50 lights 10 hours. I believe that they are also arranging for a small installation in the Western Electric Company's place.

Johnson, Holland & Company intend also to handle motors. With Mr. Fay connected with both the Chicago Arc Light and Power Company and Johnson, Holland & Company, these two concerns having between them the arc light, the incandescent light from accumulators, and the electric motor, the natural conclusion is that the two concerns will work together pretty closely. This being the case the public is not likely to lack for electric lights or electric power.

I presume you will conclude, after reading the above, that Mr. Fay is rather stirring things up electrically here. This is in fact just what he is doing.

The following from the Chicago *Mail* has not a little interest: "A new 'jigger' went up on the Board of Trade yesterday afternoon. About a year ago it occurred to an electrical expert that a 'dial' placed in a prominent part of the exchange hall that would show the fluctuations of wheat would save a myriad of questions. He made the suggestion to a fellow expert—Roberts, of the Chicago *Times*—and between them they devised the dial, popularly dubbed 'jiggers,' which now on the Produce Exchange both at Chicago and New York exhibits the prices as quickly as they are made to persons outside the pit as well as in it. The 'jigger' which is now prostituted to the duty of exhibiting prices on the New York and Chicago exchanges, was originally devised for no such commonplace office. It was gotten up twenty-two years ago in Boston by Tom Edison and Roberts to record the votes of the members of legislative bodies, the two young men having the crazy notion that a 'vote recorder' which would silently and exactly indicate the ballots of senators, congressmen, legislators and aldermen would make the patentees rich. The "vote recorder" of 1865 was elaborated and patented. It was possible with it for a legislator to touch an 'aye' or 'no' button on his desk on a roll-call, and instantly, without his opening his mouth, his name was printed on the 'aye' or 'no' column of a sheet on the presiding officer's desk. The device worked beautifully. It was built at Charley Williams' famous electrical model works in Boston and cost $300. Roberts had to pay the entire bill, as he was the manager of the American Telegraph office in that city, while Tom Edison was only a lank and unkept telegraph operator in the same office, with no money and no credit. The 'vote recorder' was built and paid for and worked without a hitch, but no legislative body wanted it. The two enthusiastic inventors discovered that they had missed altogether the American legislator's idea when they thought that he was anxious to have his vote recorded in silence, unembellished by explanations or eloquence of any sort. Roberts made a herculean effort with Smith Weed to have the "vote recorder" put into the new capital at Albany, but failed. Then Edison assigned the "right and title" to his one-half interest and the invention was forgotten. It was not until last year that the "vote recorder" was thought of again. Then it occurred to the electrical expert who has charge of the Board of Trade ticker service, that if the Roberts and Edison invention could keep track of legislators' votes it certainly could keep up with the market fluctuations. It needed only a suggestion to Roberts to set that gentleman at work. The old "vote recording" model was brought out from its resting-place and dusted off. A little work and a little adaptation soon put it into its new line of duty, and one day when the wheat speculators came down-town they found the "jigger" at work in the gallery of the Exchange hall. It worked so well for wheat that another was put up for corn, and another will soon be at work for the benefit of the speculators in pork. Roberts has just gotten back from New York, where he put up for the Produce Exchange one of the machines for the New York speculators."

I take the following from the Macon correspondence of the St. Louis *Globe-Democrat*:

Professor A. C. Longdon, who has charge of the Departments of Physics and Electrical Science in St. James' Military Academy at this place, has had in operation for several months a small electric light circuit, the electromotive power and current of which is furnished by a battery of only half a dozen cells. Edison lamps of six and eight candle-power are used, and the light is constantly used for class-room and experimental purposes, being able to run steadily as long as four hours. The battery by which the current is produced is simple, yet differs in many details of construction from any other in use. It is a modification of the Fuller battery, but has a different depolarizer. There is a peculiar device for supplying the zinc whereby it is entirely consumed, and a cut-off which wholly prevents any consumption of metal except when the light is actually in use. The arrangement is made so as to secure the highest possible electromotive force with the lowest internal resistance. The storage battery is entirely done away with, and the small cell battery has run as long as six weeks without a renewal of the solutions. The circuit is an open one, and the lights are arranged for temporary use in four different rooms. By means of a button-switch, the current is turned on or off at any hour without manipulation of the battery.

The system has not yet been applied to the purpose of general illumination, but another and larger plant is now being constructed with a battery of fifteen cells. This, it is thought, will give a full sixteen candle-power light. Should the larger experiment prove equally successful, quite a step will have been taken in the progress of incandescent electric lighting. Not the least among the advantages that such a system would present is the fact that current which produces a perfect light is so weak as to cause the slightest perceptible shock when the wires are touched. The connection between the poles of the battery and the wires of the lamp may be made with the fingers without danger, while the current passing through them produces a light.

The Mather Electric Company has removed to 38 and 40 La Salle street. One of this company's late sales is a plant for F. Albert & Company's mill at Muskegon, Mich.

Mr. W. H. McKinlock, secretary of the Central Electric Company, 38 and 40 La Salle street, expresses himself as being more than satisfied with the constantly growing business of their company. They are continually adding to their stock, and among some of the latest accessions is a full line of Ayrton and Perry's electrical test instruments.

D. H. Dorsett & Company have removed to 14 Pacific avenue, Commerce Building, room 30.

The Illinois Secretary of State has granted a license of incorporation to The Electrical Construction Company, at Chicago, to deal in electrical supplies and machinery; capital stock, $2,500; incorporators, Frank S. Terry, William H. Johnson and Francis W. Parker.

The Sprague Electric Railway and Motor Company have established an office here at 185 Dearborn street, Adams Express Building, with Mr. C. M. Barclay as manager.

Mr. J. L. Barclay will have the management of the western department of Holmes, Booth & Haydens. His office is at room 10, 185 Dearborn street.

Col. S. G. Lynch, broker, 146 La Salle street, Chicago, furnishes me the following telephone stock quotations:

Bell of Mo.	$155@$157
Central Union	50@ 51
Chicago	385@ 400
Colorado	20@ 22
Cumberland	80@ 85
Great Southern	30@ 33
Michigan	74@ 75
Rocky Mountain Bell	40@ 45
Wisconsin	105@ 107

W. A. K.

THE TELEGRAPH.

A New Pacific Cable has been recommended by the Colonial Conference recently sitting in London.

The French Cable Broken.—The direct French cable was broken last week. It was found to be out of order and investigation showed the fracture to be near this end—probably by an iceberg drifting over it. The company's steamer has been sent out to repair the damage.

Wyoming.—The Idaho *Statesman* says: A company has been organized at Seattle to build a railroad and telegraph line from Seattle on the most practicable route to the British Possessions on the north, and from there a road and telegraph line will be built to the Canadian Pacific.

Ocean Intercommunication.—Mr. Edison, who has returned from Florida, says that he made experiments while South which convince him that telegraphing through water without the aid of a wire will ultimately be made possible as a regular practical matter, so that, for instance, ships several miles apart at sea may communicate with one another. That this can be done has already received several experimental demonstrations, as our readers know.

Accusation of False Affidavits.—The Bankers & Merchants' litigation was on again last week in one of its endless and confusing developments, when an accusation was brought by one of the lawyers, Mr. Guthrie, against Col. Ingersoll and Mr. E. Lauterbach, accusing them of filing false affidavits, knowing them to be such. The attack was energetically responded to by Col. Ingersoll, in defense of his own reputation as well as that of his colleagues and clients.

Stock Quotations Public Property.—Judge Dykman has rendered a decision to the effect that stock quotations are public property. This is a victory for the New York Consolidated Exchange, which has been obtaining these quotations from the Stock Exchange through the Commercial Telegram Company, against the opposition of the Stock Exchange. The decision also strengthens the Commercial Telegram Company, whose ejectment from the Stock Exchange has been sought.

Delayed Messages.—Dow, Jones & Co. think they have fresh cause of complaint against the Western Union Telegraph Company. It will be remembered that some months ago the Western Union Company, through an operator, President Green said, furnished a competitor of Dow, Jones & Co. with some information that belonged exclusively to the latter. The fresh complaint is closely related to the old one. A special correspondent of Dow, Jones & Co. sent a dispatch from Cleveland last week regarding the Lake Shore meeting held there. This dispatch, the firm claims, was received at the Western Union operating room, 195 Broadway, at 12:32. It reached the delivery room in the same building, at 12:45. It was sent from 195 Broadway by a messenger boy to Dow, Jones & Co., on Wall street, and was received by them at 1:30 o'clock, three-quarters of an hour after it reached the delivery room. At 12:30 an opposition agency published a dispatch which contained the same information. Why this delay? inquire Dow, Jones & Co. Why the delay in delivering the message, and why should it be sent from 195 Broadway, instead of from 16 Broad street, the distributing point for down-town business?

THE TELEPHONE.

Burnet, Tex.—The Texas Telephone & Telegraph Company, with a capital stock of $10,000, has been formed by A. R. Johnson, J. Cole, J. R. Hudson and others.

Virginia.—A bill has been introduced in the Virginia Legislature to incorporate the Central Virginia Telephone Company and the Albemarle Telegraph and Telephone Company.

Telephone Manufacture in Canada.—The Bell Telephone Company has won the suit of Wright vs. the Bell Company of Canada. The Canadian commissioner of patents decides that the importation of the commercial instrument is not an importation of any of the Edison patents.

Northern New York.—The Northern New York Telephone Company was incorporated in Vermont on May 5, with a capital of $1,000. The route is through Clinton, Franklin and Essex counties, N. Y., through Vermont and the Dominion of Canada. Benjamin F. Sargent, Joseph B. Yorke and Alfred P. Sawyer, all of Lowell, Mass., are the incorporators.

THE ELECTRIC LIGHT.

Natchez, Miss.—Mr. T. Reber proposes to put up an electric light plant.

Cleveland, Tenn.—Mr. A. C. Green is about to erect an electric light plant.

Houston, Tex.—The gas company is reported to intend putting in an electric light plant.

Richmond, Me.—An electric light plant is to be put in at Richmond by Mr. H. A. Foster.

Cincinnati, O.—B. Hey & Co. have recently enlarged their factory, and put in the Loomis lighting system.

Roanoke, Va.—The Roanoke Electric Light Company has been formed. Mr. Henry Fairfax is its president.

St. Augustine, Fla.—The St. Augustine Gas and Electric Light Company is to erect a station to cost $40,000.

Fresno, Cal., is to have a good electric light plant; and Grass Valley will have another, to be operated by water-power.

Chattanooga, Tenn.—It is said that Mr. Simons, of New Orleans, is organizing a company to furnish incandescent lights.

Kankakee, Ill.—The Kankakee Illuminating Company, incorporated by W. W. Hauch and others, has a capital stock of $10,000.

Larned, Kan.—The Larned Electric Light Company has been incorporated by C. E. Campbell and others, with a capital stock of $35,000.

Detroit, Mich.—A part of Lafayette avenue is to be lighted by the Edison municipal system. The company will then bid for 5,000 incandescent lights.

Atlanta, Ga.—A lighting company—the Empire—has secured ground, charter, etc., and will erect a building 40 by 65 feet. Details of steam and electric plant not yet decided.

Pottsville, Pa.—Proposals for lighting the town by electricity and gas will be received up to May 17. Mr. C. H. Parker is the chairman of the Lamp and Watch Committee.

Western Coal Mines.—The Oregon Improvement Company are lighting up all the coal mines by electricity, and propose putting electric roads at the mines to haul the coal.

Isolated Accumulators.—The New York Isolated Accumulator Company, of New York City, has been formed by W. Foster, Jr., and others, with a capital stock of $50,000.

Underwriters' Wire.—A jury of experts in Philadelphia have just "particularly called to notice the unreliability of the so-called 'underwriters'' insulation when used in the open air."

The Mutual Accumulator Company, of which details have already appeared in New York Notes, has been incorporated in Brooklyn by T. E. Otis and others, with a capital stock of $50,000.

Charleston, S. C.—It is reported that the local gas company contemplates erecting an electric light plant and that the electric light company is about to build gas works. "Turn about is fair play."

A Newspaper Plant.—The New York *Tribune*, which has been running a Sawyer-Man plant for two or three years, has been well pleased with the result, and is about to enlarge by putting in another machine.

Kennedy Transformers in Use.—The offices and platform of the Caledonian Railway Station, Cathcart, Scotland, are now being lighted by the alternating system, Rankin Kennedy's transformers being used.

Mount Vernon, N. Y.—The American Illuminating Company, of Mount Vernon, N. Y., has been organized, and a 100-light plant of the American system established there. Their lights are running well and giving perfect satisfaction.

Pacific Slope Lighting.—Mr. R. A. Simon, electrician, San Francisco Electric Construction Company, writes us that he will be glad to supply information to any one wishing to know about lighting, old and new, on the Pacific Coast.

The Thomson-Houston System is now in use by close upon two hundred local companies and gas companies in this country. The system was practically unknown before 1883, since which time this remarkable record has been made.

Belleville, Ont.—The Belleville Gas Company, S. R. Earle, manager, has bought out the local electric light company, and will run both plants. It has a four years' contract with the city for 16 lamps to begin with. The plant has a capacity of 50 lights. Two circuits will be worked.

Harlem, N. Y.—The new trans-Harlem Electric Light Company will soon make a move for the erection of poles on which the wires will be strung. The principal thoroughfares in the annexed district will be covered. The plants of the new enterprise will probably be located at Mott Haven.

Harlem River.—Owing to the great brilliancy of the arc lights on the bridge across the Harlem River, this city, navigation has been rendered difficult, it is said, and the use of the lights has been discontinued. The proper remedy would have been to "tone up" the lighting of the whole neighborhood, which has looked the more dismally dark with its gas lamps in contrast with the arcs.

Nashville, Tenn.—The McLaughlin Portable Electric Light and Power Company has been incorporated by J. McLaughlin, J. Hirshfeld, F. Miller, W. W. Ker and G. Smyth. This appears to be an offshoot of the Philadelphia company controlling Mr. McLaughlin's inventions, some of which have already been described in these columns.

An Invited Accident.—A sad accident, if such it can be called, occurred last week at the Adams Express Stables, this city, where an engineer showing his friend how he could handle the dynamo operating the electric lights, deliberately took hold of the machine and received the full current. The shock was so great that he died in a few minutes.

Car Heating and Lighting.—The Safety Car Heating and Lighting Company, of New Jersey, has been formed with a capital stock of $1,000,000. The incorporators are generally well known to electric light men, being Sidney Dillon, Henry G. Marquand, Wallace C. Andrews, Wm. P. Shinn, Richard A. Elmer, Silas B. Dutcher, Spencer Trask, J. G. McCullough, Arthur W.

Soper, Thos. Rutter, J. J. Slocum and Edward Lauterbach. The company begins work at once.

New York Electric Light Franchises.—The Aldermanic Committee on Law held a prolonged session on May 6. The members present were Van Rensselaer, Walker and Dowling. Applications for franchises from the Waterhouse, Ball, Mount Morris and other electric lighting companies were discussed. The committee failed to act on any of the applications.

Meriden, Conn.—A plant was put into Meriden about a year and a half ago by the old Fuller-Wood Company. As soon as the American Company bought the Fuller-Wood property, it completely overhauled the old station and plant, and has now installed 150 lights. The new station will be completed within a few days and it is said will be one of the finest central lighting stations in the State of Connecticut.

Springfield, Ill.—In addition to the large electric light plant in operation by the Springfield Electric Light Company, Springfield, Ill., 50 lights of which are running in the new Capitol buildings, President Ide of that company has just ordered an additional 35-light machine and lamps from the American Company. Mr. Ide writes that his American machines and lamps are giving the most perfect satisfaction to his customers in Springfield.

Nyack, N. Y.—Last week we gave details of the formation of a new local lighting company, with $20,000 capital, at Nyack. After an investigation of various systems, the company has ordered an American (Wood) plant, on which it will spend, it is said, $16,000. It will begin with two 50-light machines and 100 arc lamps. There will be 12 miles of street circuit of Clark wire, and lamps will be put on mast arms. The town takes 40 lights at $3,000 per annum.

New Haven, Conn.—The Merchants' Electric Light Company was organized not long since at New Haven, with a capital of $30,000, to operate 100 arc lights of the Waterhouse system. The capital included the purchase of land and buildings to operate in. The company was, however, refused a charter by the Legislature, owing, it is claimed, to the opposition of the old company. Mr. Merritt W. Burrell, who is prominently interested, says, however, that they intend to get the charter "even if it takes ten years."

Central Station in Paris.—A central station has lately been started in Paris operating Woodhouse & Rawson lamps. It is now operated by the Société Electrique. At present 850 lamps of 10 c. p. are in use, and 400 more have been contracted for. Gramme machines, compound wound, supply the current. The engines are in a bathing establishment, and the station instead of paying rental furnishes light and hot water free to the bath. Most of the lights are used in cafés, restaurants and the Théâtre des Variétés.

The Upward Battery made in London by Woodhouse & Rawson is being pushed as a good apparatus for small isolated lighting. The total cost of a plant, including a set of storage cells, with 25 lights, of which 10 may be on at a time, is offered for $685. The work of handling is little more, it is said, than turning on a couple of taps and winding up a clock once daily. The zincs in use last six months. The floor space occupied is 6 × 5 feet. This battery was described and illustrated in THE ELECTRICAL WORLD.

Asbury Park, N. J.—The Asbury Park Electric Light and Power Company has been organized. The company has bought the plant run last summer by the Lane Spring Hinge Manufacturing Company, and has largely increased it. It began with a 45-light plant of the Thomson-Houston system, then last summer it bought a 35-light plant of the American Company. The new company has now decided upon a large increase and has bought a 150-light plant of the American Company, making the present capacity over 200 lights.

The Gallatin National Bank Building, 34 and 36 Wall street, New York City, is one of the most complete and architectural buildings in the down-town part of the city. It opened for tenants on the 1st of May, and, when finished, will be a perfect gem in design and workmanship. The architects, Messrs. J. C. Cady & Co., have given orders through A. H. Rennie, who has had complete charge of the entire electrical work, for the installation of a 250-light Edison plant, with the accumulators of the Electrical Accumulator Company, of this city. The dynamo is being specially built for a low number of revolutions, and will be driven by a Brotherhood engine direct without belting.

The Combination of Gas and Electric Lighting is going on. The Columbus Gas Company, of Columbus, Ind., began the electric lighting business about a year ago, buying a 45-light Thomson-Houston machine. They have now increased their plant by an additional 50 lights, and have purchased a plant from the American Company. The Halifax Gas Company, Halifax, Nova Scotia, one of the oldest and most conservative gas companies on the continent, has just contracted with the American Company for a 100-light plant. The order was given after Mr. Baxter, the general manager of the company, had made a careful inspection of lighting apparatus. The Paris Gas Company, of Paris, Texas, have also just contracted with the American Company for a large arc plant, which is now being installed.

Shot in Corea.—A Japanese correspondent sends us the following: A sad accident happened in the king's palace in Seoul, Corea, on March 9, resulting in the death of Mr. Wm. McKay, the electrician sent from New York to install the Edison plant in the palace. A Corean, with the insatiable curiosity of his race, was examining a self-cocking revolver belonging to Mr. Bierstien, Mr. McKay's assistant, when it went off, and the ball entered the abdomen of the latter, death resulting 17 hours later. Shortly after the accident the Corean was seized by the king's order, and would have been beheaded had Mr. McKay not interceded with a dying request for his release, stating the shooting to have been accidental. After the death of the victim, the Corean was again seized but released finally at the entreaty of the wife of the deceased. The case is particularly sad, as the deceased leaves a young wife and infant to mourn his loss in this veritable Ultima Thule.

Sun Electric Light Company.—In reply to a query about the Sun Electric Light Company, against which the Westinghouse recently brought an infringement suit, the Boston *Herald* says: "The Sun Electric Light Company has not been consolidated with the Brush company, but control of the stock has been acquired by gentlemen connected with the Boston Electric Light Company, into which the local Brush company was merged. The same interest now controls the Merchants' Company and the New England Weston Lighting Company as well, bringing all of the companies in Boston together except the Edison. The Boston company has a capital of $1,000,000, in $100 shares, and has a growing business. The Sun Company maintains an independent corporate existence, and its stock of 50,000 shares (par $10) remains unchanged. The company has a plant of 800 lights in Boston, 400 in Woburn, where the factory is located, 400 in Bridgeport, Conn., and is putting up a 600-light plant in Philadelphia and a similar one in Rochester, N. Y. Mr. Slattery, the inventor of the system and electrician of the company, says the prospects of the company are very good."

Palestine, Tex.—The Edison Electric Light Company, Palestine, Tex., have bought the Butler skating rink, and will increase the plant to 1,000 lights at their new location. The above company has also purchased a large part of the stock of the Eureka Mill and Gin Mfg. Company. J. W. Ozment is now president; T. F. Cronise, vice-president; Dave Harris superintendent; J. H. Bryant, secretary and treasurer, placing the two corporations under one management, which will result in good to both. The electric light company has been made quite a success, and for the past five or six months has not had an idle lamp. The new station will be one of the best in the South; many new lamps have already been applied for and will be put in by August 1 next.

Idaho Springs, Col.—The Idaho Springs Electric Light Company was organized Feb. 15, 1887, with a capital stock of $10,000. It is establishing an arc and incandescent electric plant, with a capacity of 400 incandescent and 12 arc lights. The plant is being erected by Mr. C. J. Reed, general Western agent for the Jenney Electric Company, whose system will be used. Steam-power will be employed for the present, but later the company will avail themselves of the abundant water-power in the vicinity. The plant goes into operation about May 15. The officers are: J. J. Elliott, president; G. A. Chipman, vice-president; A. W. Horn, treasurer; C. J. Reed, secretary and manager, who, with R. Turner, are the directors of the company.

The Carbon Manufacturers of Cleveland, who recently entered into an agreement with each other not to sell carbons below an established price, held their first business meeting last week. There was some discussion as to the wisdom of making a scaling price-list, so that those who bought carbons in large quantities would get them at a little lower rate than those who purchased in small lots. No change, however, was made in price. Mr. Hawks wishes it distinctly understood that the Standard Oil Company has no connection of any description with the carbon combination. It has been erroneously stated that the Solar and Empire Carbon companies, of Pittsburgh, were in the combination. The Pittsburgh Carbon Company is one of the high contracting parties, but that is the only company of that city. Of course, Mr. Hawks' company, the Buffalo Electric Works, is in the combination.

The East River Electric Light Company, of New York City, has at last, after much curiosity as to its nature, been found to be a strong and pushing organization. Its directors include Martin B. Brown, the well-known city printer; John N. Hayward, Meyer Thalmessinger, president of the Mechanics and Traders' Bank; William Taylor, W. H. Chase, cashier of the National Butchers and Drovers' Bank; Richard Hamilton, cashier of the Bowery National Bank; Nelson G. Ayres, cashier of the Oriental Bank, and Samson Lachman. The company has bought the Thomson-Houston plant on Fourteenth street and Sixth avenue and contracted with that company for 1,000 arc lights of 2,000 candle-power, to be ready to operate in sixty days. Two new stations have been purchased, one on the East River and one on the North River. The negotiations have been conducted and closed through Mr. John J. Moore, the active agent of the Thomson-Houston Company. It is said that the order is the largest of the kind ever made at one time, but Mr. Moore makes very little fuss about it, saying that it means only two weeks' work for the factory.

Electric Lights in Japan.—There has been visiting the city for a few days Mr. H. M. Williams, who has recently returned from the Asiatic empires, where he went to introduce the electric light, and he says that the readiness with which the Orientals adopt these improvements is quite astonishing. In Japan most of the principal cities are now lighted by electricity, as ours are, and many of the finest houses are illuminated in the same way. A large Edison plant has recently been ordered for the palace of the Mikado at Tokio, a very large building, or rather a cluster of buildings connected by corridors and covering several acres. The Chinese do not take hold of these improvements as readily as the Japs, but are beginning to see their advantages. The Coreans are ready to adopt all modern ideas, particularly if they come from the United States. The palace of the King of Corea has a plant of 300 (Edison) lights, and was first illuminated on the birthday of the King's mother-in-law, on the 20th of February, with great ceremony. As no foreigner is allowed to look upon the features of the King or Queen, the workmen took great risks when they were putting in the apparatus, for if they had even by accident seen the face of the King they would have been put to death, according to the custom of the country. They were carried into the palace and through the corridors in palanquins, and trumpeters were sent ahead of them so that the royal family might keep out of their way.—*Chicago Herald.*

Las Vegas Hot Springs.—A party of Raymond excursionists, who had been traveling for nearly two months in the Southern States and through our sister republic of Mexico, recently spent Sunday at the Phœnix Hotel, Las Vegas Hot Springs, N. M., and they pronounced it by far the best hotel they had visited in their travels. The house is run by the A., T. & S. F. R. R. Co., the location is a very delightful one, and the appointments throughout are first-class. Electricity plays an important part in the establishment. The electric light is in each room, and every room also has an electric bell, so that not only can the guest communicate with the office electrically, but the office can also communicate in the same manner with each room. If a person asks for any one stopping at the hotel, the clerk ascertains in a moment whether or not he is in his room, by pressing the electric button. When a guest is to be called at a certain time in the morning, he is signaled in the same way, and the clerk continues to call him until he gets up and answers. This is the well-known system of the Western Electric Co., which was described and illustrated in THE ELECTRICAL WORLD on the occasion of its exhibition at Philadelphia a few years ago. The Weston (United States) is the system of electric lighting in use in the hotel. The plant has a capacity for 900 lights, but at present there are only 720 in the hotel. It is proposed, however, to put 9 lights in the depot and 7 in the boiler house, and also to light the bath-house, which belongs to the same company. The lamps in the rooms are all 16 c. p. There are two 24-light electroliers in the dining room, as well as several clusters. Two 60 h. p. Westinghouse engines furnish the motive power, and there are three 300-light dynamos in use. The plant is in charge of Mr. Thomas Parkinson, formerly of Topeka, Kan., and that it is well looked after is amply shown by the satisfaction that the lights give.

APPLICATIONS OF POWER.

Stassfurt, Germany.—An electric railway is to be built for the extensive salt mines at Stassfurt.

The Markle Engineering Co., of Detroit, are the agents for the Sprague motor in the States of Michigan and Indiana.

Winston, N. C.—The Winston Electric Light and Power Company, recently formed, is about to build an electric railway.

Wichita, Kan.—The West End Motor Line Company, Wichita, has been incorporated, with a capital stock of $100,000, by Wm. P. Carey and others.

The Gratiot Electric Railway Company, of Port Huron, Mich., has been incorporated with a capital stock of $250,000, by W. F. Botsford and others.

Mansfield, O.—The Mansfield Electric Street Railway Company has been incorporated by M. Van Rensselaer and others, with a capital stock of $75,000. The company puts in the Daft system for its road.

Westfield, Mass.—Westfield, our enterprising neighbor, is subscribing $20,000 to introduce the Daft electric motor system upon a car route of two miles. Chicopee is considering the use of electricity for the same purpose.—*Springfield (Mass.) Republican.*

San Jose, Cal.—The movement to establish an electric railway between San Jose and Santa Clara, 4 miles, of which mention has already been made in these columns, seems to be progressing very favorably. A company to build the road has been formed, and either the Daft or the Short-Nesmith system will be used.

Julien Cars in Brussels.—The Julien system of electric traction will commence a regular service with 5 cars on the tramways, at Brussels, at the beginning of next month. The system is also to be brought into use at Rio de Janeiro. The cars have been built and equipped in Belgium and will shortly receive a trial at Brussels.

San Diego, Cal.—The new Henry electric railway for San Diego, Cal., built on the system of Mr. J. C. Henry, of Kansas City, is to be fitted out with two 100 h. p. Brush generators and four 40 h. p. Brush motors. Regular trains of cars will be hauled, and it is said that a speed up to 60 miles an hour is to be attained.

Electric Railways for Flushing, Long Island.—The Flushing & College Point Railroad Company has applied to the Board of Trustees of the Village of Flushing for a franchise to construct an electrical railroad through the streets of that village, to connect with a similar line, to run between Flushing and College Point.

Litigation About an Electric Motor.—It is stated that Messrs. Siemens and Halske have threatened an action against M. Julien, at Brussels, for an infringement of their patents in electric motors. Apparatus concerned with electric transmission of power has hitherto been singularly free from disputes of this character.—*London Electrician.*

Lynn, Mass.—Post 5, G. A. R., Lynn, Mass., will give an exhibition in that place, beginning June 1. It will be specially devoted to "electricity, mechanics and the arts," and the electric motor is to be freely used to drive the machinery. Such an exhibition in the busy "City of Shoes" is bound to be a success, and there is an excellent opportunity offered to show what electricity can do as a motive power.

St. Louis, Mo.—St. Louis people are forced to use an ungainly phrase to express it, but they mean well and they are quite right. They say: "The horse, mule and donkey car must go." They have not yet decided what they would like to substitute, but they are looking into the merits of the electric car among the rest. Now that the electric railway is receiving a fair trial, there can be little doubt that the cry will soon be, all along the line: "The horse must go and the electric motor must come."

Asbury Park, N. J.—A special dispatch of May 5 from Asbury Park says: The Board of Commissioners has granted a franchise to a New York company to put down a street railway to be operated by electricity. There were two companies bidding for the privilege. One, working under the Van Depoele system, offered the town 5 per cent. of the net yearly receipts of the road, and the other, with the Daft system, agreed to pay a yearly rental of $3,000. The last proposal was accepted. It is thought the road will be a very profitable enterprise six months in the year, but that in the winter it will barely pay expenses. There has been a severe fight with the property owners on the line of the proposed road for months, but the trouble has been amicably arranged. The road is promised to be in successful operation by July.

Electric Railway Systems.—In his paper on European electric railways and systems, read before the London Society of Arts, on April 20, Mr. Reckenzaun mentioned the system devised by Profs. Ayrton and Perry, of conveying to the current by means of a well insulated cable along the track to a third rail, the sections of which are only "alive" at the time the car is passing each of them in succession. Another method, that of Pollock and Binswanger places under each car a powerful magnet, and underneath each rail section, within a thoroughly insulated

trough, is an iron armature which, attracted by the passing magnet, makes contact between the conducting cable and the surface rail, and through that with the motor on the car. Hence nothing else on the track can be touched by the current, and the rail is only in electrical service as the car passes. This method seems susceptible of many variations.

PERSONALS.

Col. D. B. Parker, superintendent of the Boston district of the New England Telephone Company, has resigned.

P. B. Delany, of synchronous-multiplex telegraph fame, and the inventor of dozens of ingenious electrical devices, returned home from Europe, by Cunarder, on Sunday morning last, in good health and spirits.

M. A. Gaiffe.—The death, in France, is announced of M. A. Gaiffe, whose name is well known in connection with several improvements in electro-medical apparatus. He was instrumental in introducing into France the industry of nickel plating.

Mayor Hugh O'Brien, of Boston, vice-president of the Boston Electric Light Company, gave a breakfast on May 9 to Queen Kapiolani, of Hawaii, at the Parker House in that city. Governor Ames was present. Among the guests identified with electrical interests were President F. A. Gilbert and lady; Mr. S. S. Sias and lady, and Gen. C. H. Barney.

Lt. Murdock, U. S. N. of the Newport Torpedo Station, has been a visitor in New York. He is at present, we understand, prosecuting inquiries as to the power of American manufacturers of dynamos to turn out machines of as compact and powerful a form as those hitherto obtained from abroad, and it seems likely that the search will be thoroughly successful.

Mr. F.W. Horn, formerly the Chicago agent for the Excelsior Electric Company, has lately taken its agency for the South, having his headquarters at Gadsden, Ala. The plant of the Excelsior system recently put in at Gadsden is pronounced one of the finest in the South. Mr. Horn is likely to do some good work in his new territory. While in Chicago he placed no fewer than 6,000 arcs from that office.

Mr. Thomas A. Edison has returned from Florida greatly improved in health by his stay there. He and Mr. Gilliland are in receipt of many congratulations on their escape from harm when the wharf they were boating from, at Kissimee Springs, gave way, precipitating several of the party into the water except Mr. Edison and Mrs. Gilliland. The occurrence looked for a few minutes, Mr. Gilliland says, as though, it might have had a serious termination.

Mr. Gardiner C. Sims, of the Armington & Sims Company, Providence, R. I., has been visiting New York. He states that the company built for Edison plants alone last year no less than 7,000 h. p. of engines. This year the average daily output of the works has been 65 h. p., maintaining the increase that has been seen throughout the last five years. The export trade, too, has undergone a notable increase, the engines being in active demand abroad in connection with electric lighting plants.

MISCELLANEOUS NOTES.

The Magnetic Mining Company is the name of a new organization formed in Virginia.

New York Subways.—The bill continuing the old Subway Commission, with full powers, has been passed in the Assembly by a large majority.

Lava Insulators.—It is reported that Mr. D. M. Steward, the well-known maker of lava insulators, etc., at Cincinnati, proposes to move to Chattanooga, where superior facilities are offered.

Fire Alarms and Railway Signals.—The incorporation is announced at Portland, Me., of the Northern Auxiliary Fire Alarm Company and the Gould-Tisdale Railway Signal Company, with a capital stock of $375,000. Mr. J. D. Gould, of Boston, is the president.

Cincinnati, O.—At the annual meeting of the Cincinnati Electrical Company, 133 West Pearl street, the following officers were elected for the ensuing year: R. Harvey Young, president; G. F. Belden, vice-president; J. H. King, secretary and treasurer; H. B. Cox, electrician; board of directors, S. P. Peabody, R. H. Young, G. F. Belden, J. H. King, H. B. Cox.

A Startling Theory.—Rather a startling theory was advanced recently at the meeting of the Elkhart County Medical Association regarding the circulative medium of the blood. Prof. W. L. Stonex presented a paper to the association taking the ground that this circulative medium is an electrical force which has its seat in the brain.—*Indianapolis Sentinel.*

The Philadelphia Electrical Club received over 40 new members at its last meeting, and now has a membership of not less than 125. It receives any person of respectability and good standing interested in electrical or scientific pursuits, and its meetings combine science and amusement in a very agreeable manner. It is evidently bent on doing good work, and has our warm wishes for its success and long life.

BUSINESS NOTICES.

Canadian Patent For Sale, on the most liberal terms for the electric gas-lighter that is having a large sale in the United States and being liberally advertised. Address H. W. Hedge, 102 Fulton street, N. Y.

Jordan & Gottfried, 208 Canal St., N. Y., carry a complete stock of iron and brass machine and wood screws, bolts, cap and set screws, taps, dies, files, twist drills, brass and rubber in tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

STOCK QUOTATIONS.

The following list, compiled by Mr. W. H. Baker, member New York Stock Exchange, 16 and 18 Broad street, gives the current quotations of electrical stocks:

May 10, 1887.

TELEGRAPH.	Bid.	Asked.
Am. Dist.	.....	37
Am. Tel. & Cable	78	79
Cen. & So. Am.	96	100
*Com. Tel	.....	.....
*Gold & Stock	.....	.....
*Inter. Ocean Tel.	.....	.....
N. Y. Mutual	80	81
Pac. & Atl.	48	54
*Postal T. & C.	.....	.....
South. & Atl.	68	75
W. U. Tel.	76⅛	76¼
W. U. Scrip.	75	80
W. U. Bonds	117	.....
Mut. U. Bonds	85½	86
TELEPHONE.		
Am. Bell	220	222
Am. Speaking	110	120
Erie	28¼	29
*Hudson River	.....	58¾

TELEPHONE.	Bid.	Asked.
Mexican	1½	1⅝
*N. Y. & N. J.	87	92
N. Y. & Pa.	.....	.....
New England	43½	43¾
*Southern Bell	120	135
ELECTRIC LIGHT.		
*Am. Electric	48	53
*Brush	100	110
*Brush Ill.	65	80
*Consolidated	.....	.....
*Daft	.....	.....
*Edison	235	240
*Edison Ill	100	105
*Edison Isolated	.....	.....
*United States	40	52
*U. S. Ill.	.....	100
MOTOR.		
*Daft	.....	.....
*Sprague	.....	.....

* These stocks are so seldom dealt in that it is difficult to give prices at which they can be bought or sold. The figures given are as near as can be ascertained.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED APRIL 26, 1887.

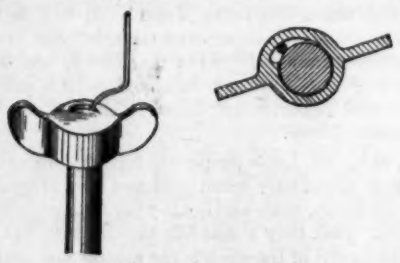
361,676. Electrical Conductor; L. Daft, of Plainfield, N. J. Application filed Jan. 23, 1886. The supports are provided with clamps for securing the conductor, and are insulated by means of plugs of non-conducting material which are protected by hoods. See illustration.

361,678. Registering Apparatus; C. T. W. Doehring and C. G. Hoffman, of Leipsic, Germany. Application filed Aug. 14, 1886. This invention is designed to simplify the registering apparatus of fire alarms, etc.

361,705. Binding Device for Electric Apparatus; I. W. Litchfield, of Warwick, Assignor of one-half to P. K. Dumaresq, of New York, N. Y. Application filed Aug. 16, 1886. A zinc stud or post is provided with a ring having an eccentric or wedge-shaped portion which grasps the wire when the ring is rotated. See illustration.

(1) 361,712. Regulator for Dynamo Electric Machines; **(2) 361,713. Fusible Cut-Out**; C. G. Perkins, Hartford, Ct. Applications filed Sept. 18, 1886. (1) For description see ELECTRICAL WORLD, May 7, 1887, page 217. (2) It is the object of this invention to furnish a cut-out device which may be securely fastened to a support and not liable to displacement when subjected to jarring.

(1) 361,730. Railway Signaling; **(2) 361,731. Electric Rope Coupler**; S. B. Stewart, Montclair, N. J. Applications filed Nov. 5, 1886. (1) A rope and gong is used for signaling the engineer from a train, as usual; but the rope



361,705. BINDING DEVICE.

serves as an insulator for two wires carried within it, which form a circuit having a separate bell or signal and battery. This circuit may be operated from different parts of the train to turn in signals. (2) This is a mechanical and electrical coupling for the rope carrying the wires.

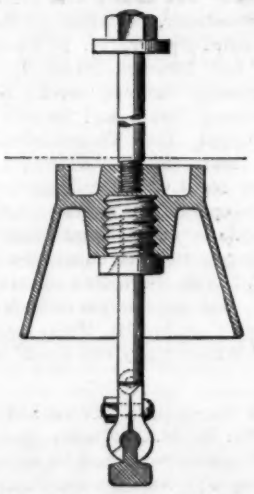
361 734. Telegraphy; F. Van Rysselberghe, of Brussels, Belgium. Application filed May 28, 1886. This consists in superposing upon any ordinary telegraph line employing gradual currents rapid intermittent currents, and in providing the necessary means for utilizing said currents for the transmission of signals. See illustration.

361,737. Magneto Electric Telephone Call; G. A. Wilkins, of Philadelphia, Penn. Application filed April 16, 1884. This call is designed to be placed on a desk or in close proximity thereto, in order that the subscriber may not have the trouble of leaving his seat to manipulate the call.

361,770. Electric Inductive Translator; W. Main, of Brooklyn, N. Y., application filed Sept. 8, 1886. The principal object of this invention is to provide means for regulating the machine and rendering it self-governing. A further object is to render the translator equally capable of receiving high tension and giving out low tension currents, or *vice versa*.

(1) 361,778. Electric Valve Operating Mechanism for Elevators; **(2) 361,779. Means for Electrically Controlling the Operation of Elevators**; **(3) 361,780. Electric Valve Operating Mechanism for Elevators**; G. H. Reynolds, of New York, N. Y., Assignor by direct and mesne assignments to the Crane Elevator Company, of Chicago, Ill. Application filed Nov. 23, 1886. These inventions are different forms of apparatus for controlling the movements of elevators. Instead of the usual rope or lever in the elevator, an electric current and motor is used to operate the water valves. A switch is placed in the car and a movement of the same will cause the valves to open or close and thus operate the elevator.

361,782. Gas and Electric Lamp Fixture; J. T. Robb, of New York, N. Y. Application filed Sept. 26, 1886. This is

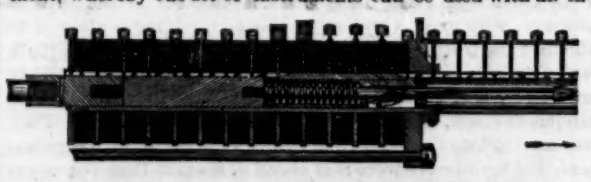


361,676. ELECTRICAL CONDUCTOR.

a swinging bracket provided with electric wires and means for attaching an incandescent lamp, also with gas conduit and burner.

361,794. Galvanic Battery; S. F. Walker, of Cardiff, England. Application filed Jan. 8, 1887. A galvanic cell in which sulphur and carbon suitably proportioned form the depolarizing agent.

361,797. Switch and Circuit for Telegraphs; S. Weaver, of Washington, District of Columbia. Application filed Jan. 21, 1887. This is a compact and convenient arrangement, whereby one set of instruments can be used with an in-



361,829. ELECTRO-MAGNETIC ROCK DRILL.

definite number of independent circuits, or lines, without danger of crossing wires or leaving open circuits.

361,829. Electro-Magnetic Rock Drill; H. N. Marvin, of Syracuse, New York. Application filed June 23, 1886. Electrical devices are employed for giving to the tool a reciprocating motion; also devices for turning the tool after each stroke, besides other details relating to rock drills. See illustration.

361,843. Apparatus for Distributing Electrical Power; E. A. Sperry, of Chicago, Ill. Application filed May 21, 1886. An arrangement of devices whereby electrical power may be derived from the mains, applied to use, measured and automatically regulated.

361,844. Safety Device for Incandescent Lamps; E. A. Sperry, Chicago, Ill. Application filed May 22, 1886. Claim 2 is as follows: The combination with an ordinary incandescing illuminating lamp, of an incandescent resistance lamp arranged in electrical connection or circuit with said illuminating lamp, and provided with a filament of larger ampère capacity than the light-giving filament.

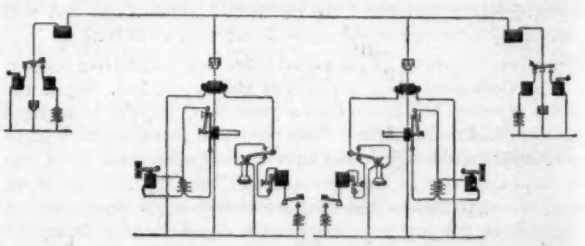
361,896. Armature Core for Dynamo Electric Machines; A. Schmid, of Pittsburgh, Penn., Assignor to the Westinghouse Electric Co., of same place. Application filed July 29, 1886. The core is made up of a series of discs, and the invention consists in forming these discs without leaving a fin or burr at the edges.

361,901. Combined Lamp and Signal Post; J. E. Smith, of New York, N. Y. Application filed Nov. 27, 1886. The ordinary lamp-post is constructed with a frame adapted to receive a signal box. The gas and electric conductors are arranged accordingly.

361,968. Water Level Alarm; J. L. W. Olsen, Copenhagen, Denmark. Application filed December 27, 1886. A float on the surface of water in boilers completes a circuit when the water is abnormally high or low.

361,973. Commutator for Dynamo Electric Machines; E. P. Warner, of Chicago, Ill., Assignor to the Western Electric Company, of same place. Application filed Sept. 9, 1886. The centre of the commutator is formed of brass, about which an insulating ring, preferably blocks of wood bound together, is formed. The segments are attached to the outside of the insulating ring.

362,005. Electric Bell; E. W. Hazazer, of New York, N. Y., Assignor to Hazazer & Stanley, of same place. Appli-



361,734. TELEGRAPHY.

cation filed Dec. 16, 1886. In this bell the binding posts are done away with, and simple means for connection to a support are devised.

362,010. Electric Covering for Indicating Abnormal Conditions; G. J. Jewill, of Philadelphia, Penn. Application filed Dec. 24, 1884. Walls, floors or other surfaces are covered with two sheets of textile material, one upon the other. The said materials have incorporated with each of them a series of wires. Pressure on the material, the presence of water or a rupture of any kind will cause an alarm, which is in circuit with the wires, to be sounded.

362,022. Apparatus for Separating Metals from Ores or Alloys by Electrolysis; Henry Liepmann, London, Eng., Assignor to the Cassel Gold Extracting Co., of Glasgow, Scotland. Application filed Oct. 6, 1886. Claim: In an apparatus for separating metals from ores or alloys by electrolysis, the combination of an anode compartment, a cathode compartment, a filtering diaphragm, as described, separating said compartments, a dense porous diaphragm for separating said compartments during one step of the operation, and mechanism whereby the dense porous diaphragm may be placed in apposition with, or removed from, the opening, between the anode and cathode compartments.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patent issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.